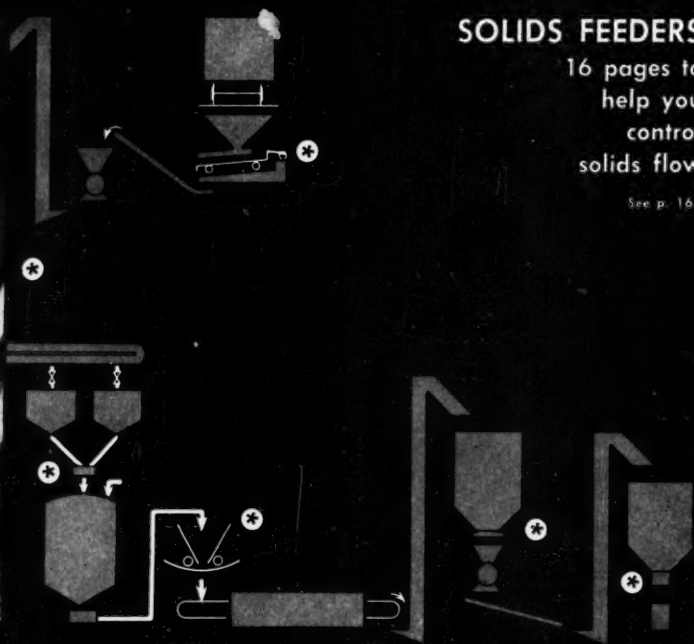
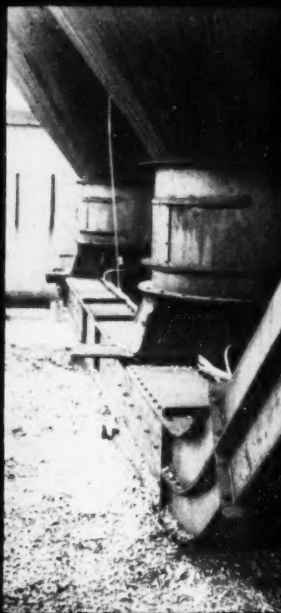


NOVEMBER  
1952

# Chemical Engineering



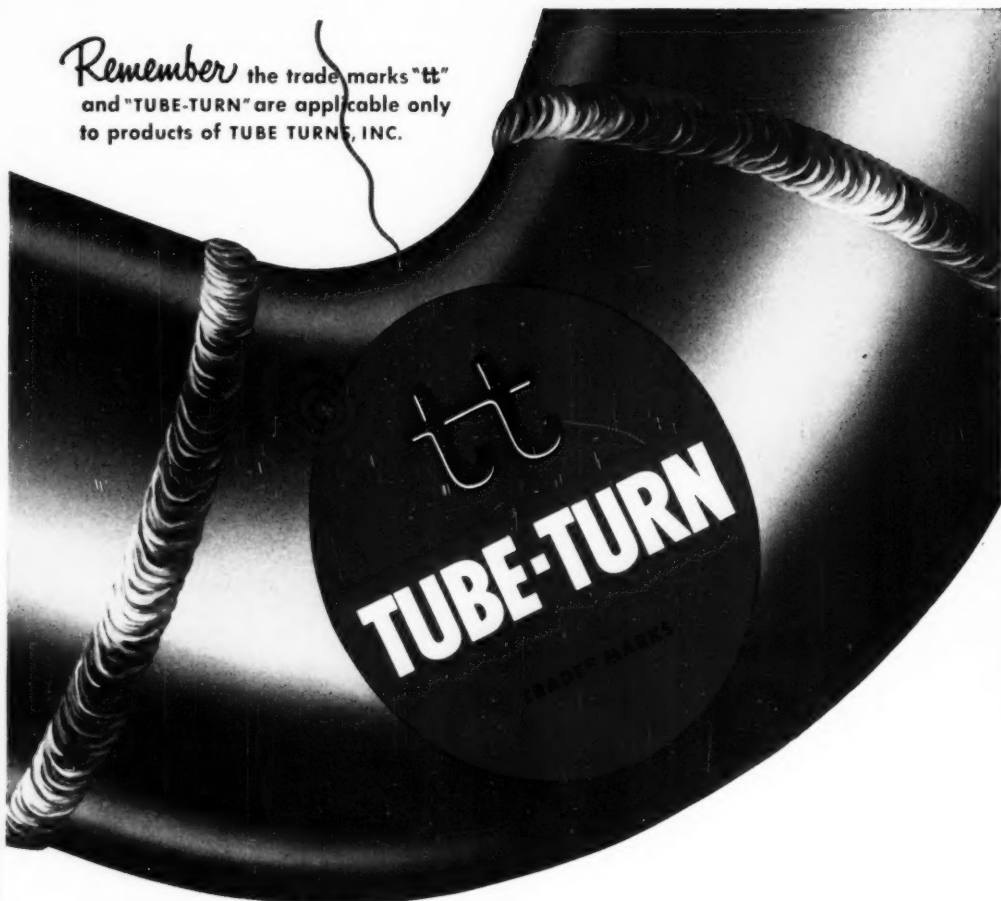
## SOLIDS FEEDERS \*

16 pages to  
help you  
control  
solids flow

See p. 163



Remember the trade marks "tt"  
and "TUBE-TURN" are applicable only  
to products of TUBE TURNS, INC.



## Engineered to save maintenance manhours



Scrappy says,  
"Aid defense—more  
scrap today... more  
steel tomorrow."

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Dimensional Data on  
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Fittings and Flanges.



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NOVEMBER  
1952

# Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

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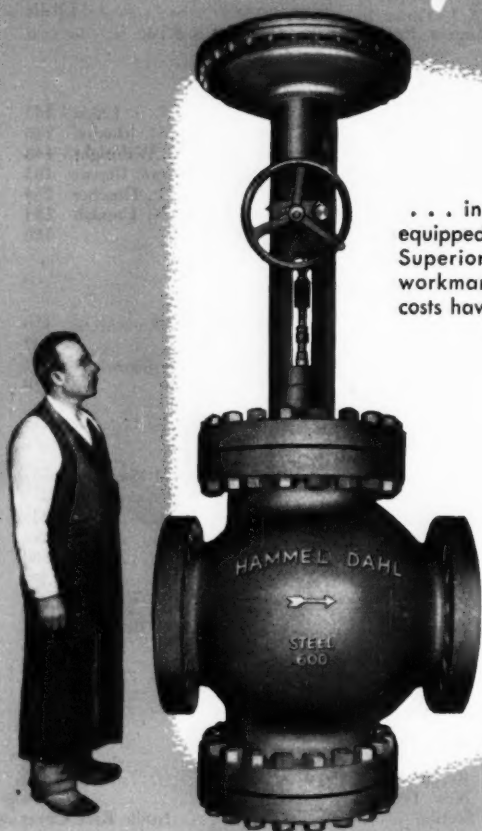
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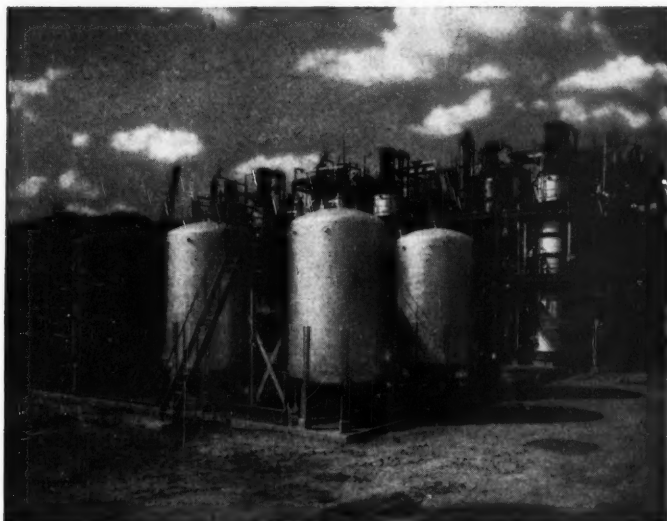
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← If you use Ethylene Oxide, let us send you our safe-handling booklet "Operating Procedures for Handling Ethylene Oxide." Please ask for Form 7618.

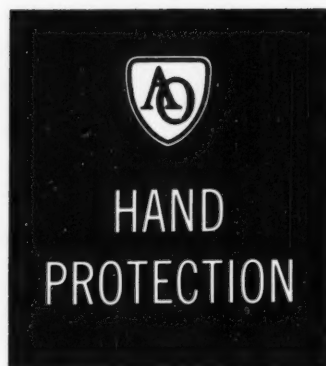
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Now . . . Seams Reduced to  
**ABSOLUTE MINIMUM**  
 on these NEW  
 AO Gloves!



AO 514 ASBESTOS GLOVE

Yes, for workers' comfort . . . for savings for our customers, we've redesigned our asbestos glove line to eliminate seams wherever possible. By reducing seams from 8 to 3, there's not only greater working ease for the user but longer work life for the glove.

**MAKE THIS COMPARISON TEST!**

Look at any conventional asbestos glove. Note the vertical seams that extend to the cuff. Note the seams that secure gauntlet to glove. Now check against the large photograph here. You'll see the seams on the thumb and only ONE SEAM extending the length of the glove (on the back). Note also the absence of horizontal seams—(thus assuring a stronger glove and longer life which means valuable savings).



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 leather-reinforced  
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- Finest grade specially treated asbestos, recommended for extreme heat.
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SOUTHBIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



Another new development using

# B. F. Goodrich Chemical raw materials



B. F. Goodrich Chemical Co.  
does not make this pipe.  
We supply the  
Geon materials only.



## From a golf course—*plastic pipe idea!*

**CORROSION-PROOF...RESISTS CHEMICALS...LIGHT WEIGHT**

**T**HIS rigid polyvinyl plastic pipe carried by the boy will serve for years in an underground irrigation system for a golf course. And—it's a pipe with many possible uses in chemical processing and other applications.

The manufacturer found every quality he needed in Geon polyvinyl chloride resin for this plastic pipe. It resists soil acids or alkalis and electrolysis—vital for sub-surface installations. It needs no protective coating or wrapping. All adding up to reduced maintenance costs.

There are more Geon advantages— and economies. Polyvinyl plastic pipe like this can be made rigid or flexible,

useful for underground or overhead piping to carry gases or liquids.

It can be made light enough for a youngster to lift a length easily. Polyvinyl plastic pipe is four to six times lighter than steel pipe of equal length, diameter and wall thickness. Savings for you in freight and shipping costs, in handling, racking and stringing costs.

This plastic pipe is another example of how Geon materials help improve products and lower costs. For Geon materials can be made resistant to heat and cold, weather, aging, abrasion and most chemicals. Color range is wide. And they come as resins, latices or compounded plastics—can

be extruded, molded, coated, cast or dipped. For helpful technical advice, please write Dept. GF-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



**GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.**

**GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors**

CHEMICAL ENGINEERING—November 1952

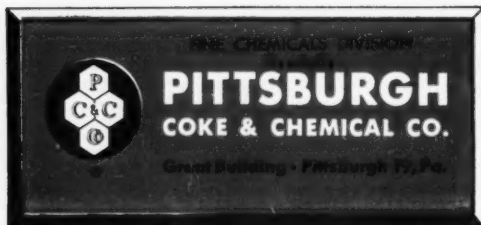


## From coal to color— That's Basic!

TRY AND NAME a product that requires a higher degree of quality control than *dye-stuffs*! They must meet color specifications right on the line, remain fast to light, laundering and wear, and apply uniformly to all types of fibers.

As a basic producer of coal chemicals, including important intermediates from which a great many dyes are made, we're in a position to provide this precise control and maintain the high quality and purity of Pittsburgh Dyestuffs *from coal to finished colors*.

This unique basic position—which offers definite advantages to buyers of Pittsburgh agricultural chemicals, plasticizers, protective coatings and the products of our other integrated divisions—will soon be helping the nation's textile industry to produce tomorrow's brighter and better materials.



W&O 4380

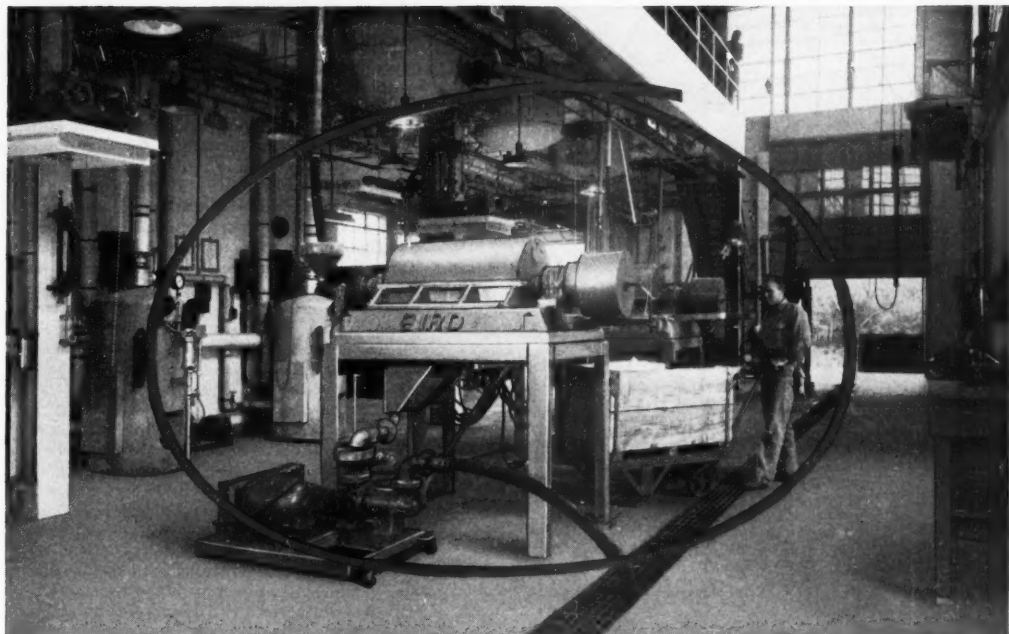
COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

This Could Be **YOUR** Filter

Working On **YOUR** Material

Finding Out What's What  
On Filtering **Quality, Capacity, Cost**

**BEFORE** You Commit Yourself  
To Any Equipment Investment



Before you spend money for *any* filtration equipment isn't it a good idea to have the facts and figures *in advance* — on *how well* it will do the job — *how much* it will handle per day — *how good a wash* it will do, if washing is needed — *what space* and *what auxiliaries*, if

any, may be required — and *what it costs* to buy, install, operate and maintain.

The Bird Research and Development Center (main test floor pictured above) has what it takes to get this information and get it quickly, accurately, completely. Why not make use of it?

**BIRD MACHINE COMPANY**  
SOUTH WALPOLE • MASSACHUSETTS

**FRESH WATER FROM THE SEA**



## USE REVERE METALS!

This is a portable compression still, which produces pure distilled water from the sea at the rate of 85 gallons per hour. It is made by Cleaver-Brooks Company, Special Products Division, Waukesha, Wis., an important producer of stills, either portable or stationary, for the Armed Forces and for industry. An important feature of Cleaver-Brooks design is the selection of metals in accordance with the water conditions to be met, whether salt, brackish, contaminated, or requiring recovery of valuable by-products. Thus, for example, the heat exchanger, of the tube-within-a-tube type may have cupro-nickel tubes and headers, or Admiralty tubes, naval brass, silicon bronze, according to the nature of the service. Such care in selection of metals is in part at least responsible for the high reputation Cleaver-Brooks enjoys.

In addition to supplying Revere Metals, we were also requested to collaborate with engineers and production men on fabrication methods, including forming, brazing, welding and annealing. Cleaver-Brooks is a large and well-staffed company, and its experience is such that it is capable of conducting its operations unassisted. However, like so many companies, it likes to have others double-check its conclusions and methods, to protect itself and its customers. The Revere Technical Advisory Staff was glad to respond to the call.

Such work is typical of the collaboration Revere offers to you through its salesmen, its Technical Advisors, and the Research Department. Remember, we do not take the place of your own engineers, designers and production people; we consult with them, and make our knowledge freely available, on a confidential basis, of course. Call the nearest Revere Sales Office. Consult your telephone book or write direct.

# REVERE

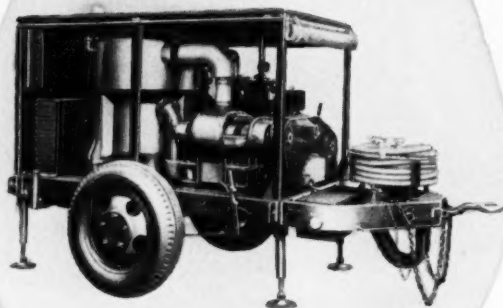
**COPPER AND BRASS INCORPORATED**

*Founded by Paul Revere in 1801*

230 Park Avenue, New York 17, N. Y.

*Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities. Distributors Everywhere*

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



Portable Diesel-driven sea-water compression still, producing 85 gallons of pure water per hour. Made by Cleaver-Brooks Company, Special Products Division, Waukesha, Wis., which also makes stationary installations for chemical, paper, pharmaceutical and similar plants, for production of pure water or recovery of valuable by-products.

# Top efficiency demands "total engineering" of screw conveyors

## LINK-BELT integrates all components to give you the right screw conveyor for your job

Whether your screw conveying problem is feeding, mixing, blending, spreading, conveying, distributing or elevating, you'll find the right answer at Link-Belt.

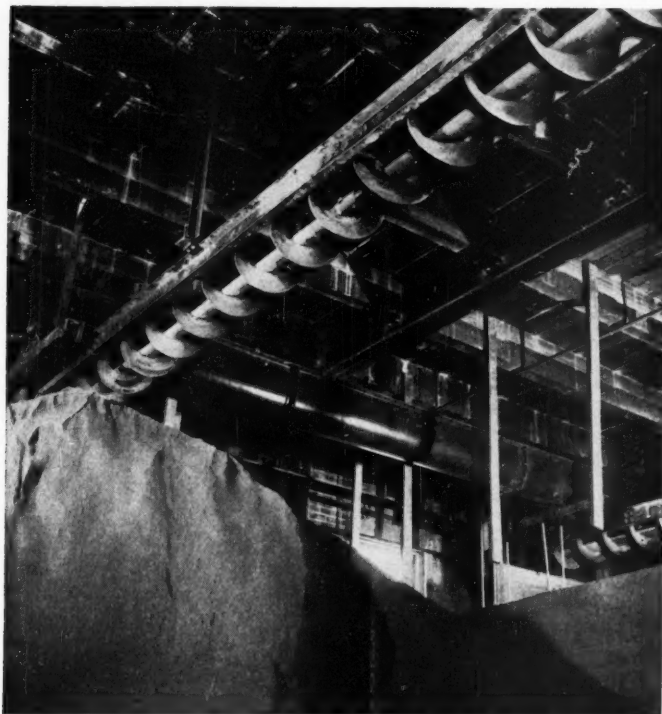
For Link-Belt Screw Conveyors are "totally engineered." That means every component is matched to the exact requirements of your job. And Link-Belt Screw Conveyors are accurately made to assure easy assembly, smooth and continuous operation.

Your Link-Belt representative can give you full information on the extensive line of Link-Belt Screw Conveyor components. Compare this complete choice of quality products with any other . . . and you'll choose Link-Belt every time.



**LINK-BELT COMPANY:** Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities.

12,727



Part of a Link-Belt Screw Conveyor system with open bottom cross conveyors for delivering powdered raw materials from railroad cars to any of 14 bins. The bed of material itself forms the surface over which additional material travels.

## LINK-BELT designs and builds all components

**SCREWS**—L-B conveyor screws cover the complete field of material characteristics: Helicoid or Sectional for general application; Cut Flight for moderate mixing; Cut Flight with Pad-



dles for added agitation of mixing; with Intermediate Paddles for moderate aeration or stirring; short pitch for inclined conveyors; ribbon flight for sticky, gummy or viscous materials; paddle type for blending dry or fluid materials; stainless steel for corrosion or heat-resistance or sanitation.



### HANGERS

—L-B hangers—available in a variety of styles and metals—provide a wide variety of mounting, bearing and cover arrangements and are designed for various volume requirements.



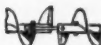
### TROUGHS

—L-B builds flanged, angle flanged, flared, rectangular, dust-seal, jacketed and drop-bottom types in any metal. Variety of connections, supports, covers and clamps offers added design flexibility.



### SPOUTS & GATES

—Spouts can be of the plain discharge opening, fixed discharge or detachable discharge types. Slide gates can be hand or rack-and-pinion operated.



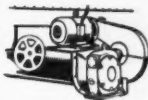
### SHAFTS & COUPLINGS

—Conveyor drive and end shafts have closely controlled tolerances for correct bearing clearance. Couplings can be of the split flight type to facilitate installation where space is limited.



### TROUGH ENDS

—Steel plate, cast iron or stainless ends match all trough shapes, provide required shaft bearing support and alignment. Can have seal glands to protect bearings.



### DRIVES

Link-Belt engineers many forms of drives to suit specific conditions — worm gear, Electrofluid, P.I.V. variable speed, and chain drives of various types.

Link-Belt can also supply a full range of flanges, thrusts, covers, saddles and countershaft ends.



# NEW LIGHT ON AN OLD SUBJECT\*

Bringing new light to bear on the varied uses of

its products is part of Niagara's service to industry.

## NIALK® Carbonate of Potash

This potash salt is finding increasing favor in the development and production of special dyes for the textile industry, since its carefully controlled purity and quality are particularly helpful in achieving and maintaining a true color.

Quality plus cooperation keeps NIALK products at the forefront in research and product improvement.

## NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, New York

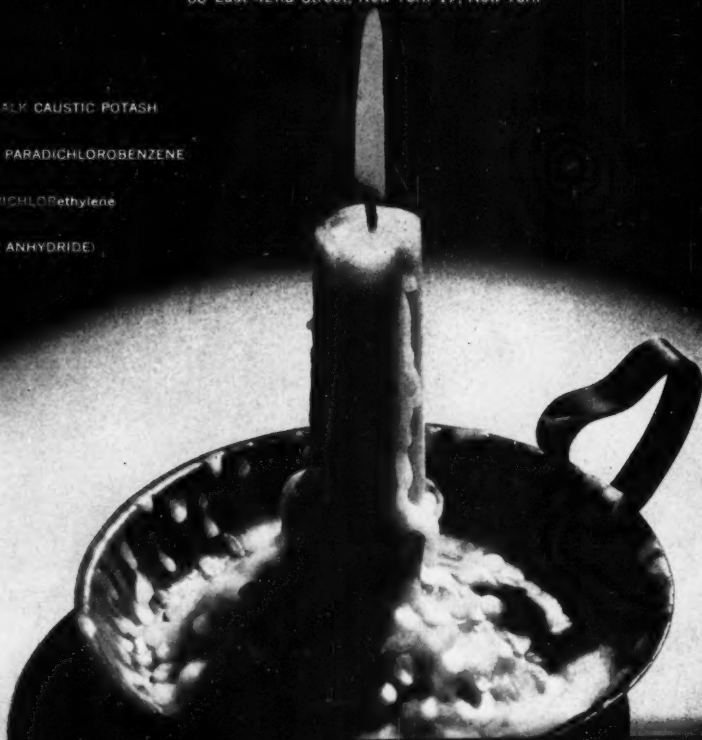


NIALK LIQUID CHLORINE NIALK CAUSTIC POTASH

NIALK CARBONATE OF POTASH NIALK PARADICHLOROBENZENE

NIALK CAUSTIC SODA NIALK TRICHLORoethylene

NIAGATHAL® (TETRACHLORO PHTHALIC ANHYDRIDE)



# Only B. F. Goodrich makes the grommet belts that cut costs 20 to 50%!

*Save 3 ways! Investigate today!  
Write or mail coupon*

You save belt costs because belts last longer, save production costs because machines keep running with fewer interruptions, save maintenance costs because they need less attention.

Patented grommet belts by B. F. Goodrich represent the only basic change since invention of the V belt. Belts last 20 to 50 per cent longer, depending on service. (The more severe the service, the greater the increase over ordinary belts.) Grommet belts have more rubber; they're more flexible, give better grip, less slip.

## *What is a grommet?*

A grommet is like a giant cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord section as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

## *All cords put to work*

Each of the two grommets and every part of a grommet carry their share of

the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

## *Better grip, less slip*

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give  $\frac{1}{3}$  more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

## *Send for proof*

Send the coupon for a set of reports telling users' experiences and showing actual installations where grommet belts outlasted all others. Some typical cases:

"... within a few days ordinary belts had stretched ... After six months of 24-hour-a-day service BFG grommet belts haven't stretched at all ..."

"Ordinary belts lasted only 5 or 6 weeks ... B. F. Goodrich grommet belts are in their sixth month of service ..."

"Previous belts suffered from shock loads, wore out fast ... BFG grommet belts have been in service 2 years with no shut-downs ..."

There are hundreds of cases like these.

## *They cost no more*

BFG grommet belts cost not one cent more than others. The savings they make for you are clear profit. They are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent No. 2,233,294).

Write, send the coupon or see your B. F. Goodrich distributor. (He will show you his "X-ray" belt that shows the grommet construction clearly.)

**Grommet V-Belts**  
BY  
**B.F. Goodrich**  
FIRST IN RUBBER



The B. F. Goodrich Company  
Dept. CE-11  
Akron, Ohio

- ☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich grommet belts outlast all others.
- ☐ Have distributor show me the "X-ray" belt that shows how B. F. Goodrich grommet belts are made.

Name

Firm Name

Street Address

City

State

**ALLIS-CHALMERS  
METAL-CLAD  
Switchgear**

**... with  
Transfer Bus**

***SAVES  $\frac{1}{3}$  the Cost***

**YOU PAY ONLY** for the addition of the transfer bus . . . not a complete set of duplicate switchgear.

***SAVES  $\frac{1}{2}$  the Space***

**ALLIS-CHALMERS** supplies transfer bus right in the same cubicle as switchgear, without adding cubicles . . . thus cutting floor space requirements in half.

**TAKE A TIP FROM UTILITIES!** Their experience in many installations proves that you, too, can eliminate duplication of switchgear in many places . . . yet assure power continuity.

### **WHAT IS A TRANSFER BUS?**

It's a by-pass bus circuit that parallels the main switchgear bus . . . with means provided for switching loads to the transfer bus. This added bus makes it possible to withdraw and maintain circuit breakers, or inspect main bus without power outage. This method proved by utilities in hundreds of installations.

Ask an Allis-Chalmers engineer about transfer bus arrangements and what they can mean to your plant in savings and service. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3887

**ALLIS-CHALMERS**



3

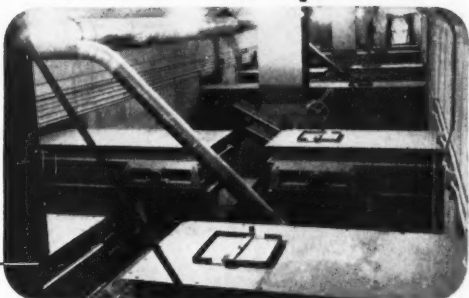
## Fairfield installations

speed grain handling at Central Soya's Decatur Plant

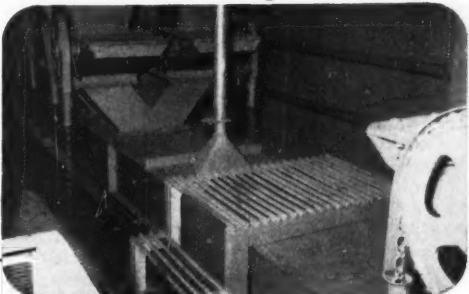
*Fairfield Installation Number One* features 2 Fairfield Drag Conveyors which take soft feed from any one of 13 storage bins and carry it to vertical conveyors for eventual loading of trucks, railroad cars, pellet mills or bagging scales.



*Fairfield Installation Number Two* incorporates 12 Fairfield Drag Conveyors that remove meal directly from large storage silos and feed this meal onto a large belt conveyor for further distribution to a bagging scale or railroad car. The Fairfield conveyors can be operated singly or in multiples, depending on requirements.



*Fairfield Installation Number Three* utilizes 2 Fairfield Drag Conveyors which carry feed pellets from 16 bins to the bagging scales or bulk feed trucks. Versatile design enables these Fairfield conveyors to be charged from either end or carry material in either direction, depending on loading destination.



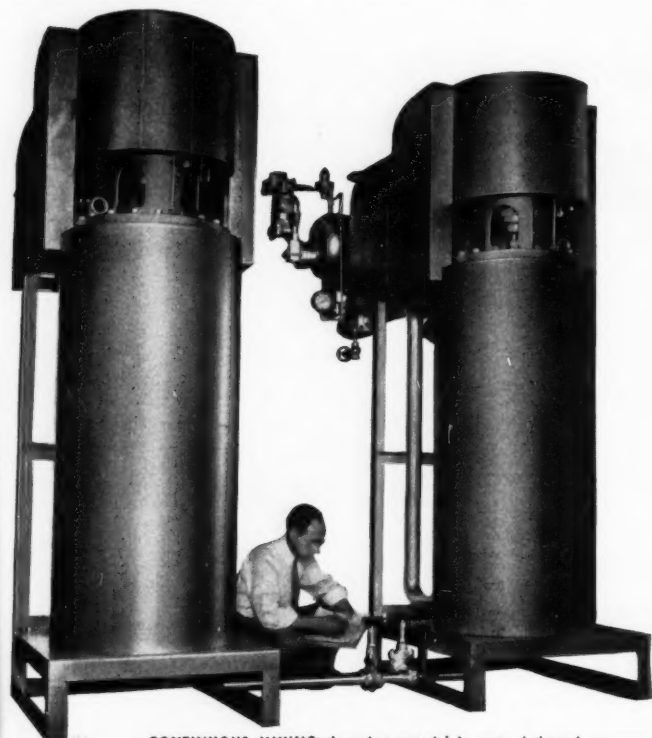
These installations at Central Soya of Decatur, Indiana are just a few examples of Fairfield's complete engineering, manufacturing and erection service to solve material handling problems. Regardless of the type of material you process, Fairfield's complete one-source responsibility can profitably solve your material handling problems. Send for a free copy of Bulletin 152 outlining Fairfield services today.

**FAIRFIELD**

**THE FAIRFIELD ENGINEERING COMPANY,**

**Chicago Ave., Marion, Ohio**

# Girdler Process News



**CONTINUOUS MIXING.** Incoming material is pumped through a narrow, annular passage, is thoroughly mixed by revolving blades. This compact, closed, heat-transfer system processes continuously at high speed for high daily throughputs.

## Improves efficiency of chemical reactions with VOTATOR® Heat-Transfer Apparatus

**O**PERATING on a continuous, closed-system basis, VOTATOR Heat-transfer Apparatus gives high rates of heat transfer... is widely used for heating and cooling, crystallizing, controlling heat of reaction, and other processes.

Used as a continuous mixer and chemical reaction vessel, this equipment offers many advantages:

- reactants can be injected at multiple points, and air or other gases can be metered and introduced continuously.
- a mixture of two or more reactants can be maintained, and heat of reaction closely controlled.

- reaction temperatures are achieved quickly, avoiding undesirable side reactions.
- viscous liquids can be handled easily, and the reacted product can be extruded.
- hazardous chemicals can be processed safely.

Absolute and precise control of time and temperature is automatically maintained... resulting in greater uniformity and substantial labor savings. Mixing is thorough and intimate, and reactions can be completed in a matter of seconds. Thus remarkable volume can be attained in a small space.

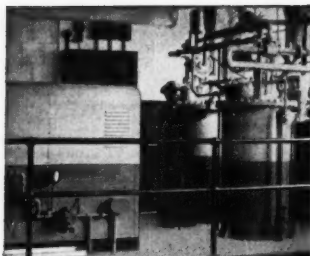
The **GIRDLER** Corporation

LOUISVILLE 1, KENTUCKY  
Votator Division

**VOTATOR DIVISION:** Processing Apparatus for the Food and Chemical Industries

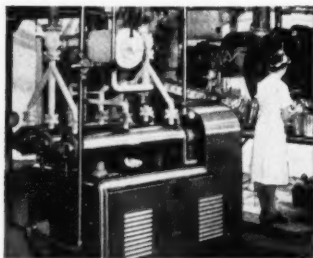
**GAS PROCESSES DIVISION:** Designers, Engineers, and Constructors for the Petroleum and Chemical Industries

**THERMEX DIVISION:** Industrial High Frequency Dielectric Heating Apparatus



### Processes Grease in 3 Minutes

VOTATOR Grease-making Apparatus cooks and cools ingredients for grease for this manufacturer in a 3-minute cycle. Time-consuming, labor-taking batch methods are eliminated. With continuous processing under precise, automatic control, grease uniformity is maintained easily. Moisture content and temperature are controlled accurately.



### Sterilizes and Pasteurizes

A wide range of food products are sterilized and pasteurized at very high efficiency with VOTATOR Heat-transfer Apparatus. This equipment is particularly effective for materials that are heat sensitive, very viscous, or which undergo a physical change during the process. The entire cycle of heating to temperatures of 280° to 290°F, holding, then cooling the product to a predetermined temperature is accomplished continuously in seconds.

### Want Information?

Girdler's Votator Division designs and builds complete plants for processing edible oil, food, and many other products; and supplies heat-transfer equipment for continuous processing of liquid and viscous materials. Write for Bulletin V-48. The Girdler Corporation, Votator Division, Louisville 1, Kentucky. District Offices: New York, Atlanta, Chicago and San Francisco.





# Looking For Long Belt Life?


**THIS STORY SHOULD SHOW YOU THE ANSWER!**

**W**HEN this advertisement appeared 11 years ago, the COMPASS 40 Belt specified by the G.T.M.—Goodyear Technical Man—had already served 10 years without a shut-down. Earlier belts had all caused trouble due to the extremely heavy drive.

## TODAY

—this belt is still running—for a total life so far of 21 years and 7 months—proof of Goodyear's design-for-the-job that means longest service at lowest cost in the long run.

### A RECORD CUT IN MARBLE



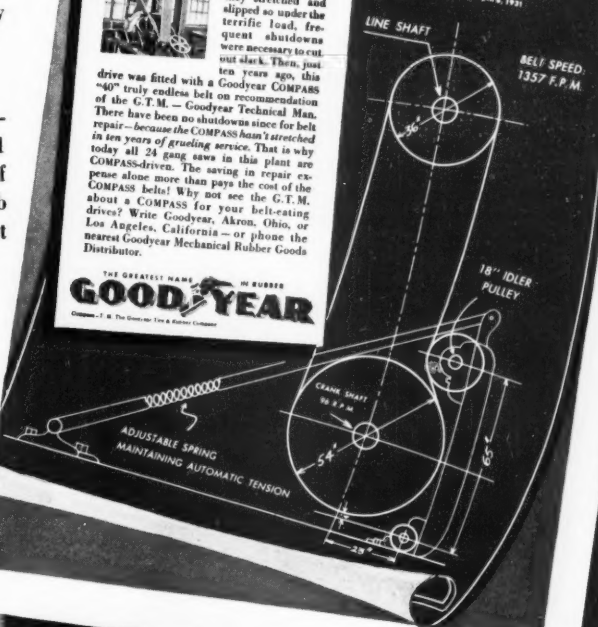
**THE** drive you see here runs a twelve-bladed gang saw that slices huge blocks of marble into a dozen slabs — simultaneously! Belt after belt was tried on it, but they stretched and slipped so under the terrific load, frequent shutdowns were necessary to cut out slack. Then, just ten years ago, this drive was fitted with a Goodyear COMPASS "40" truly endless belt on recommendation of the G.T.M. — Goodyear Technical Man. There have been no shutdowns since for belt repair — because the COMPASS hasn't stretched today all 24 gang saws in this plant are COMPASS-driven. The saving in repair expense alone more than pays the cost of the COMPASS belt! Why not see the G.T.M. about a COMPASS for your belt-eating drives? Write Goodyear, Akron, Ohio, or nearest Goodyear Mechanical Rubber Goods Distributor.

**GOODYEAR**

THE GREATEST NAME IN RUBBER  
Copyright © 1951, The Goodyear Tire & Rubber Company

**Specified**

**GOODYEAR COMPASS "40" BELT**  
31" long x 10" wide (truly endless)  
for MARBLE GANG-SAW DRIVE  
The Georgia Marble Company  
Tus, Georgia  
Installed, April 3, 1931



LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.

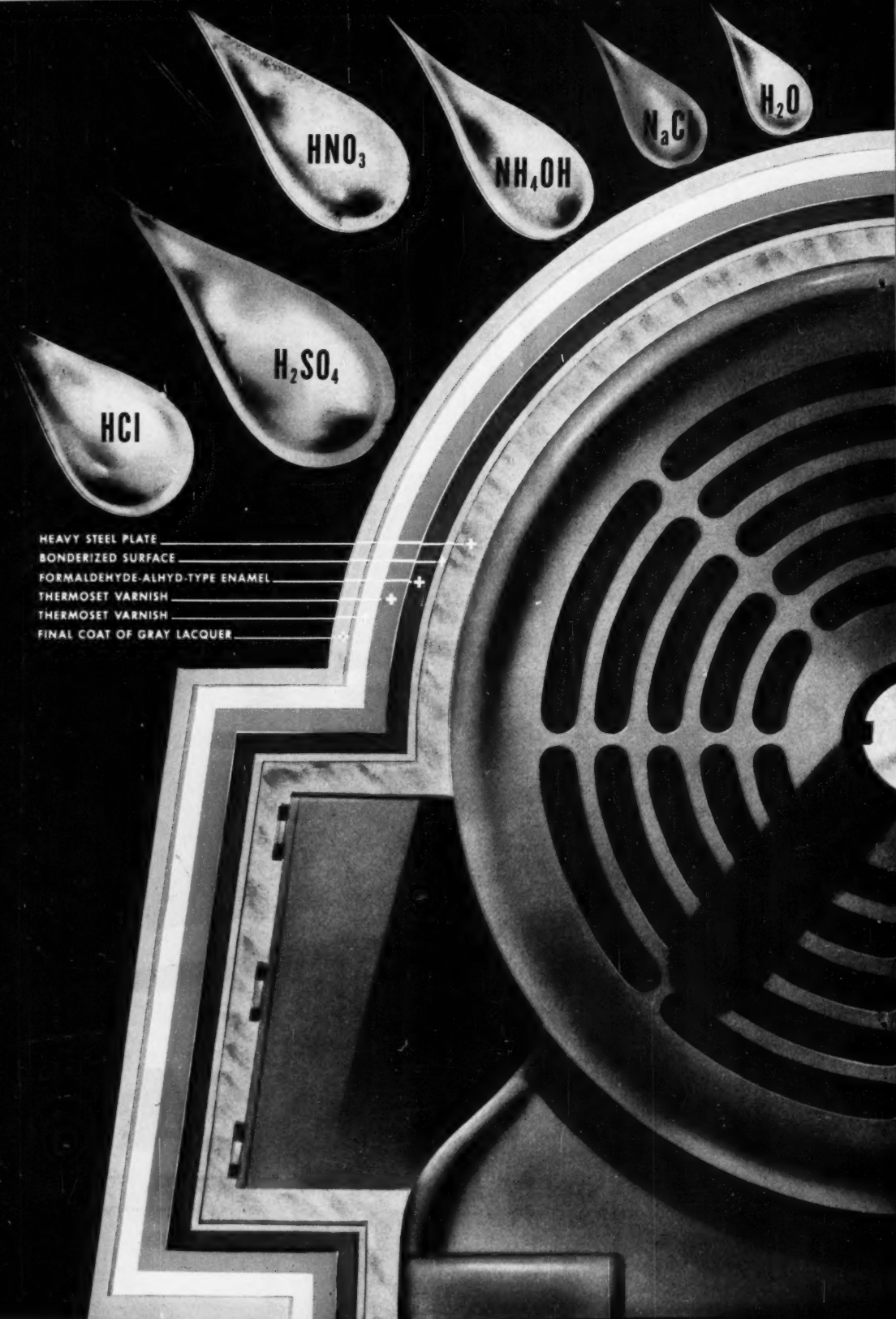
# GOODYEAR

**THE GREATEST NAME IN RUBBER**

*We think you'll like "THE GREATEST STORY EVER TOLD" — Every Sunday — ABC Network*

*Compass—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio*

CHEMICAL ENGINEERING—November 1952



$\text{HNO}_3$

$\text{NH}_4\text{OH}$

$\text{NaCl}$

$\text{H}_2\text{O}$

$\text{H}_2\text{SO}_4$

$\text{HCl}$

HEAVY STEEL PLATE  
BONDERIZED SURFACE  
FORMALDEHYDE-ALHYD-TYPE ENAMEL  
THERMOSET VARNISH  
THERMOSET VARNISH  
FINAL COAT OF GRAY LACQUER

# This Chemical Motor has

## *Uniform Wall Thickness*

## *No Weak Spots!*

The thinnest part of any motor frame determines how soon corrosion will cause it to fail. The cross-section drawing below shows the difference between Life-Line rolled steel frames and most cast-iron-type frames. Life-Line motor frames have UNIFORM wall thickness at every point—*thicker than the thin sections of most cast-iron-type motor frames.*

### PLUS-PROTECTION PROVIDED BY FIVE SPECIAL COATINGS

Five layers of special protective coatings are applied to every Life-Line chemical motor to further inhibit corrosion. These five bands of protection are:

1. Bonderization on the steel frame
2. Formaldehyde-alkyd-type gray enamel
3. & 4. Two layers of Thermoset varnish
5. Final coat of dark-gray lacquer.

Combine the uniformly thick walls with these five plus-bands of protection and you can see why Life-Lines last longer.

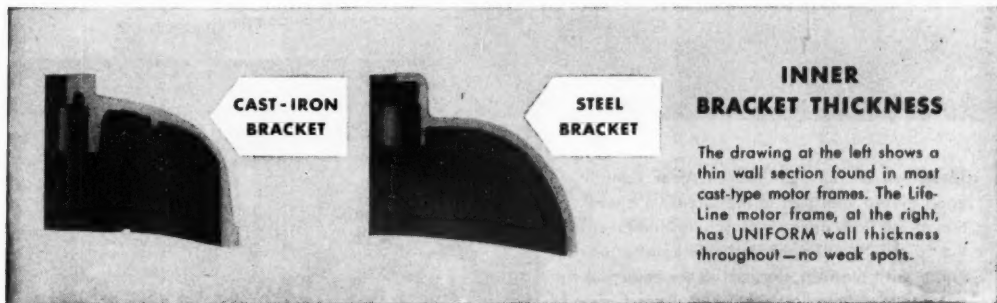
### LIFE-LINES DOUBLE LIFE OF CONVENTIONAL MOTORS

Actual field installations show that the Life-Line chemical motor has an extra long service life. Take the case of the motor operating a pump for thiocyanate at a large New England coke plant. The pump splashes the corrosive fluid over the entire motor. Conventional motors lasted a maximum of six months. A Life-Line chemical motor was installed. It has been operating the pump for over a year—and is still going strong. Proof again of longer life.

### WANT SOMETHING EXTRA IN A CHEMICAL MOTOR?

Extra protection against corrosion—or outages from any cause? Specify "Life-Line"—they cost no more. Get your copy of Chemical Motor Booklet B-4687 from your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-21661



YOU CAN BE SURE.. IF IT'S  
**Westinghouse**

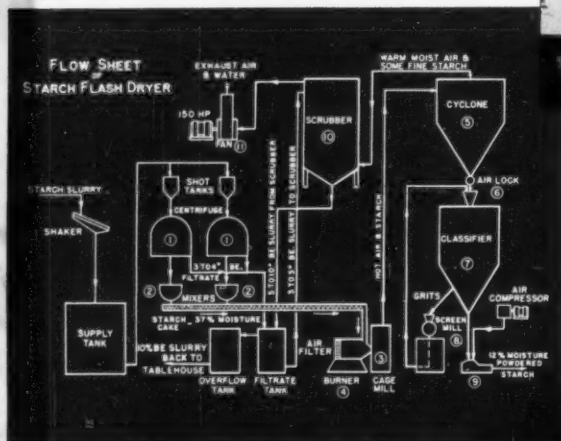
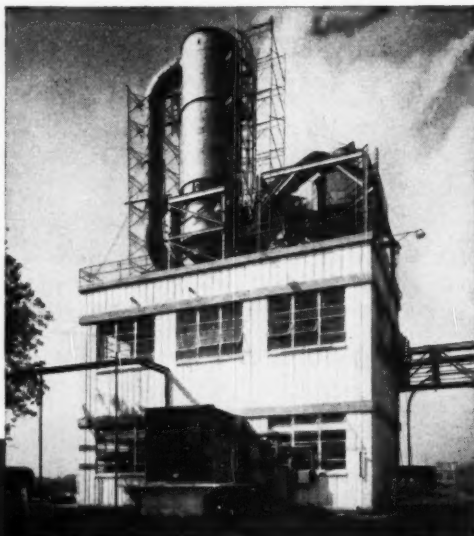
*Life-Line*

MOTORS and CONTROLS



# AMERICAN MAIZE-PRODUCTS COMPANY of Hammond, Ind. revolutionizes starch production with new flash drying unit and two BAKER PERKINS Centrifugals

New flash drying plant of the American Maize-Products Company is the first commercial application of flash drying to corn starch. The plant can handle approximately 300,000 lbs. of corn starch daily, an increase in the Company's starch drying capacity of more than 50%. And the quality of the product is far better than that produced by the old kiln method of drying. Two BAKER PERKINS ter Meer Centrifugals dehydrate starch slurry to a moisture content of 35% for the flash drying unit.



Flow sheet diagram of the new flash drying plant. This new method of drying corn starch is faster and more efficient than any other drying method now used in the corn refining industry. Production is higher; capital and operating costs are lower. And the two BAKER PERKINS Centrifugals shown in the diagram help keep production high and costs low for the American Maize-Products Company.

These two BAKER PERKINS ter Meer Centrifugals play a vital part in the successful operation of the flash drying unit. In this installation, they are fully automatic, but they can be provided with manual controls if necessary. A simple cycle controller makes complicated centrifugation cycles easy, and the control cycle will compensate for most any process variables. BAKER PERKINS Centrifugals are available in several capacities for production work as well as in laboratory and pilot plant models.



229

## BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION • SAGINAW, MICHIGAN

# Improve Your Operations With This New Resin Kettle

**DIRECT FIRED**

**SHORT HEAT-UP**

**HIGH FUEL ECONOMY**

**SAFE**

**QUICK COOL-DOWN**

**RADIANT "BLACK HEAT"**

**NO REFRACTORY WALLS**

**PERFECT CONTROLLABILITY**



To heat kettles and autoclaves which process heat-sensitive materials Blaw-Knox engineers have developed a new oil-fired furnace of proven superiority. Through a unique arrangement of the burners and a pre-sooting of the heating surface, 75% of the heat is transmitted by radiation.

This new furnace has a low heat capacity, develops no local hot spots and responds rapidly to either manual or automatic temperature controls . . . Blaw-Knox Radiant Heating is adaptable to all reaction vessels and all processes. For detailed information write to

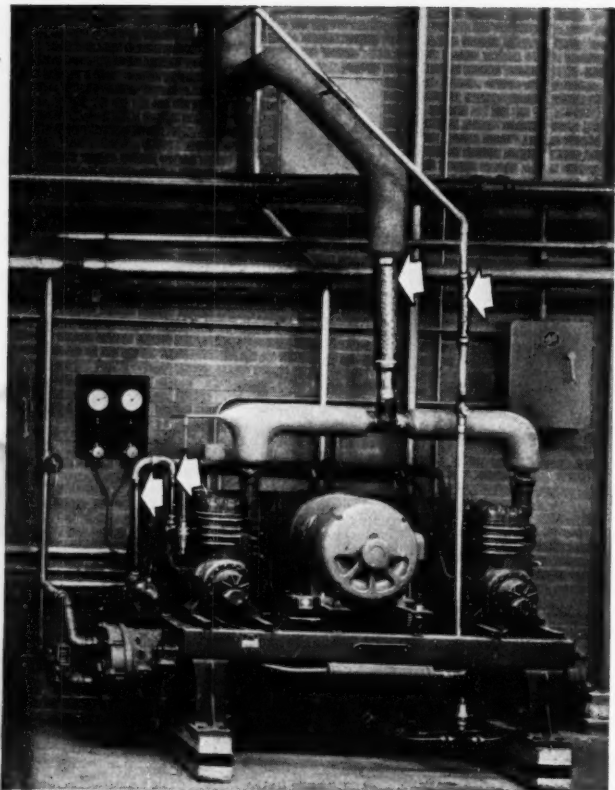


## BLAW-KNOX CONSTRUCTION CO. CHEMICAL PLANTS DIVISION

930 DUQUESNE WAY, PITTSBURGH 22, PA.

Tulsa 1, New York 17, Philadelphia 3, Chicago 1, Birmingham 3, Washington 5, D.C., San Francisco 5





## News about flexible metal connectors

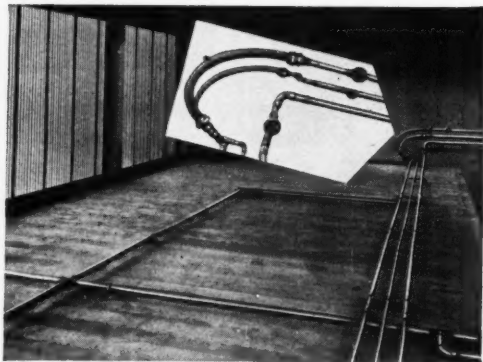
Here they absorb **VIBRATION**,  
permit **EXPANSION**, withstand  
**PRESSURE** and **HEAT**

**VIBRATION** These twin compressors are part of an office air conditioning system. To prevent transmission of noise and vibration to refrigerant lines, American Vibration Eliminators have been used. They have proven their usefulness many times where vibration might crack rigid piping or make maintenance difficult. Leakproof and permanent as piping, they safely convey such liquids and gases as freon, brine, chlorides, etc., under high and low pressure.



**PRESSURE and HEAT** In this Littleford Pressure Distributor, American Flexible Steel Tar and Asphalt Hose, in constant motion, sprays hot tar under pressure. It handles easily, withstands outdoor exposure. If you want hose that can endure such rugged service, yet installs quickly, is convenient to use, and needs little attention, plan on American Flexible Metal Hose and Tubing.

Write for Booklet SS-50 — gives complete information on American Flexible Metal Connectors and their uses. The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.



**EXPANSION** Hot water for this shower system flows 200 feet. To make proper expansion loops with rigid piping would be a plumber's nightmare of joints! The simple solution: easily installed American Flexible Metal Connectors. They allow for ample expansion and readily handle required pressure. They may be also used to carry steam, oil, syrups, solvents and even certain semisolids.

62363



wherever connectors must move *American* flexible metal hose and tubing

# Do You Know WHY? BY DR. Q



## GUARDING THE GLAMOUR OF MOVIE STARS!



**N**OT IN THEIR COSMETICS (IT MIGHT HELP THERE, TOO), BUT IN THE FILM'S DEVELOPER SOLUTION. HERE, **QUADRAFOS**® HAS PROVED BEST FOR PREVENTING CALCIUM AND MAGNESIUM SALTS FROM CAUSING WHITE SPOTS ON THE FILM AFTER DRYING.



## REDUCING VISCOSITY WITH LESS LIQUID

.06% **QUADRAFOS** EQUALS 16.1% WATER IN REDUCING VISCOSITY. GIVES SMOOTH FLOW TO MAXIMUM SOLIDS WITH MINIMUM WATER IN PAPER COATING, TEXTILE PRINTING, OIL WELL DRILLING, ETC.

**NO RUST!  
NO SCALE!**



## KEEPING IRON PIPES AS CLEAN AS BRASS

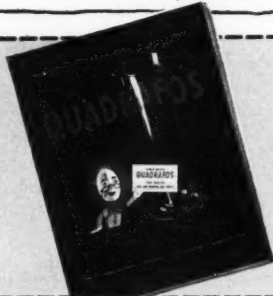
ONLY 2 PARTS OF **QUADRAFOS** IN 1,000,000 PARTS OF WATER JUST ABOUT ELIMINATES CORROSION. ALSO PREVENTS HARD WATER FROM FORMING CALCIUM SCALE.

## FIND OUT WHY...

... **QUADRAFOS** OF ALL THE POLYPHOSPHATES OFFERS YOU THE BEST COMBINATION OF SUCH PROPERTIES AS: SEQUESTRATION, SOLUBILIZATION, DEFLOCCULATION, EMULSIFICATION and CORROSION CONTROL. USE THE COUPON BELOW FOR LATEST FACTS.

**ONLY WITH  
QUADRAFOS**

CAN WATER  
DO SO MUCH, SO WELL



### RUMFORD CHEMICAL WORKS

Technical Service Department  
Dept. CE-11, Newman Avenue  
Rumford 16, Rhode Island

Please send me Bulletin 66, describing in detail the properties and uses of Quadrafos — what it is, what it does, and its many advantages in chemical processing applications.

Name .....

Firm .....

Address .....

City .....

Zone .....

State .....

# KELLEY

**STAINLESS STEEL**

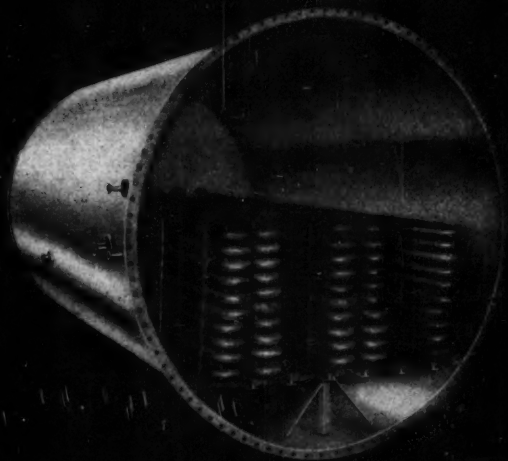
**LEAD**

**WOOD**

**STEEL**

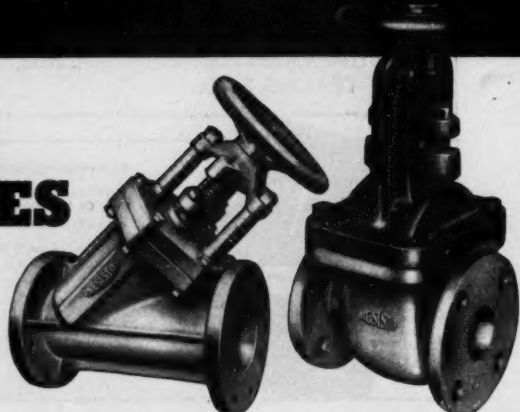
**Fabrication**

## Custom



## LEAD VALVES

Hard Lead • Lead Lined Iron or Steel Body •  
Hard Lead Castings • Pumps •  
Fittings • Lead Cocks



**RESISTO PIPE AND VALVE CO.**

CAMBRIDGE, MASSACHUSETTS  
A Division of O. G. Kelley & Co.

# - Built Equipment *for*

ACID PLANTS  
•  
CHEMICAL PLANTS  
•  
PAPER &  
PULP MILLS  
•  
BREWERIES  
•  
FOOD PLANTS  
•  
DAIRY PLANTS  
•  
RAYON PLANTS  
•  
TEXTILE PLANTS  
•  
PETROLEUM  
REFINERIES  
•  
BLEACH &  
DYE HOUSES  
•  
BEVERAGE  
DISPENSERS  
•  
MEAT PACKING  
PLANTS  
•  
PHARMACEUTICAL  
PLANTS  
•  
WINERIES



## O. G. KELLEY & CO.

ENGINEERS

DESIGNERS

FABRICATORS

96 TAYLOR STREET, BOSTON 22, MASS.

CLEVELAND, OHIO  
HOUSTON, TEXAS

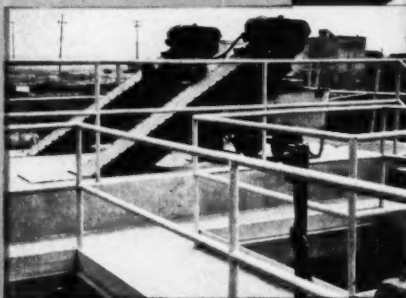
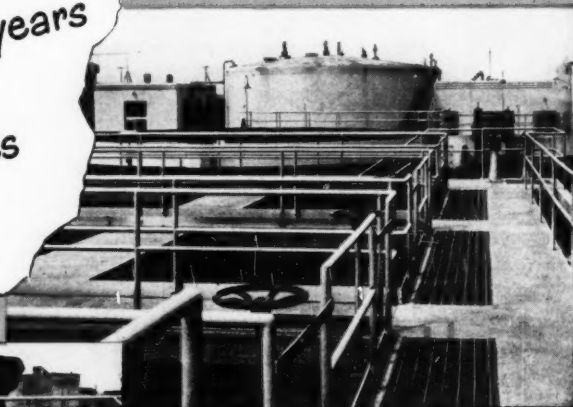
NEW YORK, N.Y.  
JOHNSON CITY, TENN.

PITTSBURGH, PA.  
ELIZABETH, N.J.



# Parlon Stays On!

"Paint intact after more than 2½ years of corrosive sewage fumes and sludge"



Exteriors of digesters, clarifiers, and control and pump buildings at San Leandro, California, Sewage Disposal Plant finished with Ramuc masonry paint based on Parlon. Pipes and railings and grit conveyor housing protected with Ramuc utility enamel. The finish on all parts of the installation remains intact despite 2½ years continuous exposure to sea fog, sewage fumes, and heavy hydrogen sulphide fumes emanating from a nearby dump and scavenger plant. Ramuc masonry paints and utility enamels based on Parlon are manufactured by Inertol Co., Inc., Newark 5, N. J.

SEWAGE FUMES and sludge...hydrogen sulphide gases...heavy salt sea fog...heat...cold...condensation...day in and day out! How long can exterior paints take this punishment? At California's San Leandro Sewage Disposal Plant, Inertol's Ramuc paint based on Hercules Parlon (chlorinated rubber) continues to protect and beautify masonry and metal after more than 2½ years of severe exposure.

Wherever corrosion is a problem, not only in sewage disposal plants and water works, but in paper and textile mills, metal refineries, breweries—to name a few of the many places where Parlon-based finishes now serve—you can depend on these sturdy protective coatings to check attacks from acids and alkalis, to give better service at lower long-term costs. See your paint supplier for details on Parlon paints, or write:

Cellulose Products Dept., **HERCULES POWDER COMPANY** 952 Market St., Wilmington 99, Del.

## Parlon<sup>®</sup> CHLORINATED RUBBER PAINTS

AVAILABLE FROM 400 PAINT MANUFACTURERS UNDER THEIR OWN BRAND NAMES





# ONLY HUDSON GUARANTEES TO REPLACE MULTIWALL SACKS DAMAGED ON YOUR PACKER

**Exceptional quality of Hudson Multiwall Sacks permits unusual guarantee**

PALATKA, FLA. Heretofore each Multiwall Sack user has individually absorbed the cost of any sacks which break on his filling and closing machines. But now, Hudson becomes the first and only Multiwall Sack manufacturer to guarantee to replace such broken sacks at no further cost.

According to experts, the average user of Multiwall Sacks normally expects to write off the loss of certain sacks during each day's run. These sacks are damaged due to circumstances beyond control of the Multiwall Sack manufacturer. Overloading of sacks, malfunction of packing or closing machines, or inattention on the part of the operator are some of the common causes of sack breakage.

Hudson is confident that the quality of the Multiwall Sacks they produce can eliminate most of this breakage. That is why they are willing to offer you complete protection through filling and closing operations. Only a company with a superior product would dare offer their customers such a guarantee.

## **First in industry to offer this replacement guarantee**



T. H. Mittendorf

NEW YORK CITY. "Hudson is the first and only Multiwall Sack manufacturer to offer a written replacement guarantee on breakage of Multiwall Sacks," declared T. H. Mittendorf, Hudson's Vice President in Charge of Sales. "Hudson Multiwall Sacks lead the industry as



Hudson Representative, Harry Rafferty (center), points out the packing and closing operations covered by Hudson's new guarantee, to J. Dummett (left), Plant Supt. for Wedron Silica Company.

being the world's most fully guaranteed. We believe they represent the best buy on today's market."

"Under the terms of our unusual guarantee the buyer is protected from the moment he accepts custody of the sacks until the sacks have successfully passed his filling and closing operations. This guarantee greatly extends our usual warranty of quality and workmanship," Mr. Mittendorf pointed out.

## **Goes into immediate effect**

The new Hudson guarantee plan went into effect with all sacks purchased on or after Sept. 15, 1952. Early reports indicate that the guar-

antee is being enthusiastically received.

Prompt delivery on all contracts are assured by the tremendous capacity of Hudson's fully integrated mill at Palatka, Fla. High quality is maintained through inspection and controls at every step from tree to the finished Hudson Multiwall Sack. Hudson packaging engineers see that sacks conform to the exact needs of each user.

## **Urge Multiwall Sack users to write for facts**

The Hudson Pulp & Paper Corp. invites all users of Multiwall Sacks to learn how the new guarantee works by writing for facts.

**Send for full details:**

Tell me, without obligation, about the many advantages of your new Multiwall guarantee.

NAME \_\_\_\_\_

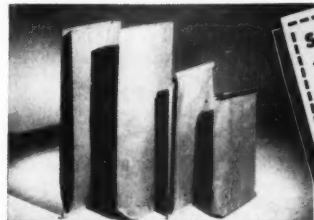
COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_

ZONE \_\_\_\_\_

STATE \_\_\_\_\_



Hudson Multiwall Sacks are available pasted or sewn, and in valve and open mouth styles.

Hudson Pulp & Paper Corp.  
Dept. 132, 505 Park Ave., New York 22, N.Y.

take a

**CLOSER LOOK**

at

# NEW TTT diagrams

for B&W Croloy 7 and B&W Croloy 9  
High-Temperature Tubing

Finding new facts about the behavior of alloy, stainless, and carbon steel tubing to help users with application and installation problems is a regular major function of the B&W Technical Service. For example:

Isothermal transformation data recently were made available for the first time on B&W Croloy 7 and B&W Croloy 9 tubing. Extensive research and tests on these two popular intermediate alloys for high-temperature services provided sufficient data to construct the time-temperature-transformation diagrams reproduced on the opposite page. They furnish helpful information relating to the heat treatment, general fabricating and welding, and particularly the hardenability of these tubing steels.

A technical report TR 520 covering the TTT tests and findings is yours for the asking.

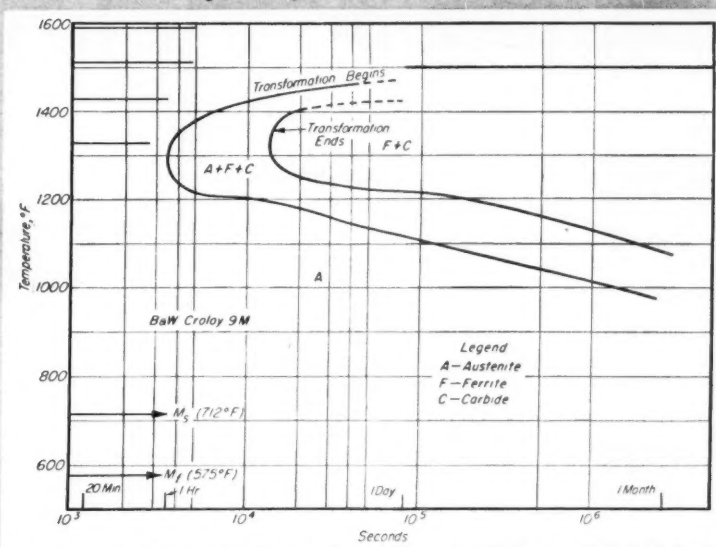
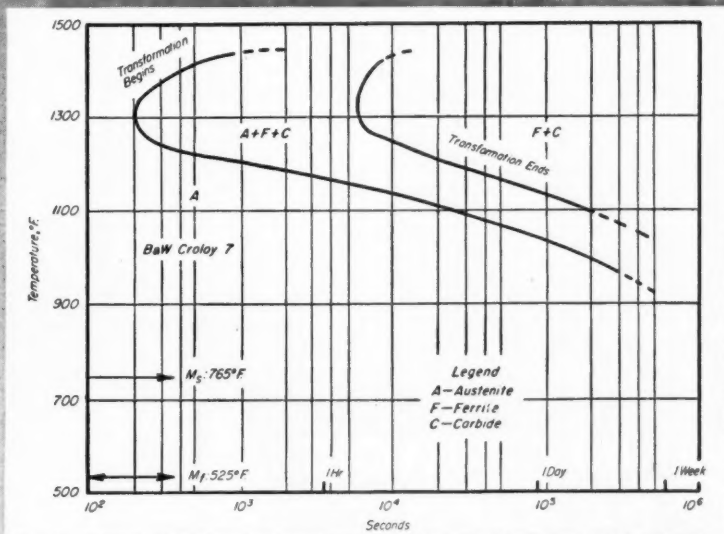
## CONDENSED DATA

### B&W Croloy 7 and B&W Croloy 9 Tubing

**B&W Croloy 7** (7% Cr., 0.50% Mo)—For operating conditions where excellent corrosion resistance to hot oils is primary consideration. Has good oxidation resistance and high-temperature strength to 1250 F.

**B&W Croloy 9** (9% Cr., 1% Mo)—Offers very good corrosion and oxidation resistance with good high-temperature strength to 1300 F. It is particularly suitable in refinery applications where sulphide corrosion is encountered. Good resistance to steam oxidation to 1100 F. Particularly suited for hydrogenation processes.

Both of these intermediate alloys have gained wide acceptance for giving optimum service satisfaction with economy in oil refineries, and petrochemical, chemical processing, and hydrogenation plants. They're worth investigating. You'll find Mr. Tubes—your local B&W Tube Representative—a good man to consult on *any* problem involving alloy, stainless or carbon steel tubing.

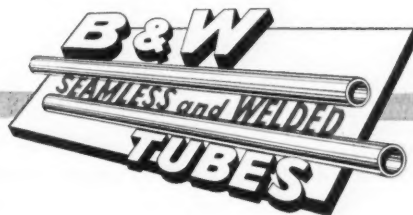


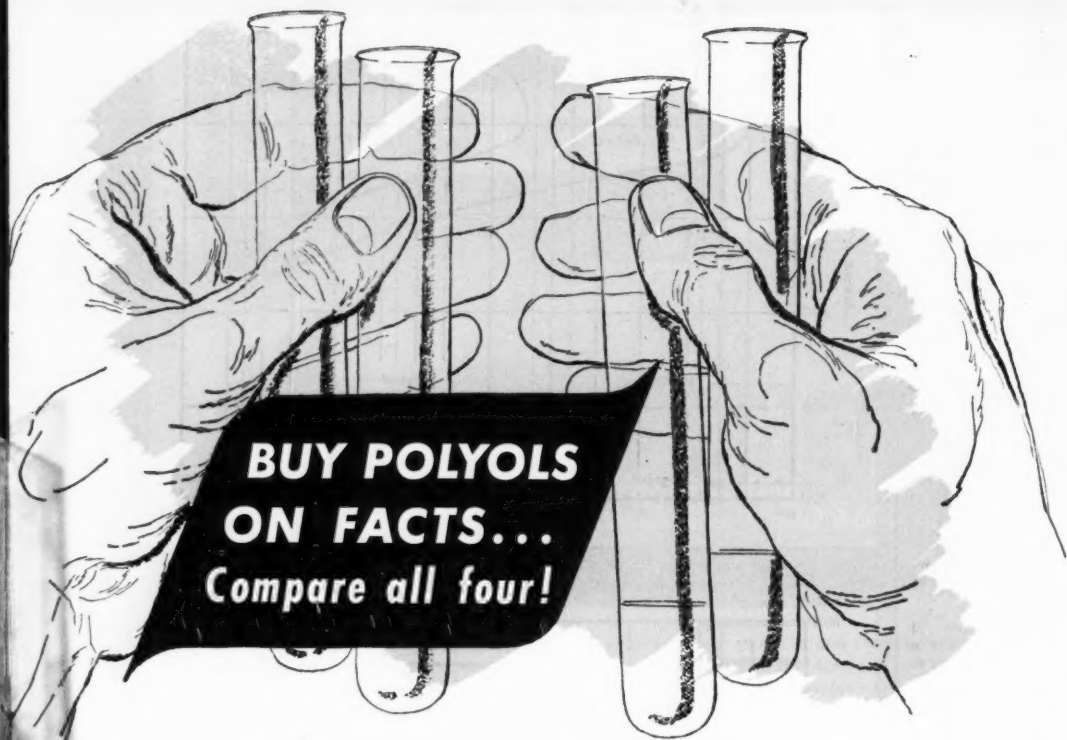
# **THE BABCOCK & WILCOX COMPANY** **TUBULAR PRODUCTS DIVISION**

## **General Offices & Plants**

Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing  
Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. •  
Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19,  
Texas • Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2,  
Pa. • St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y. •  
Toronto, Ontario • Tulsa 3, Okla.



**FACT:****Sorbitol leads in stability**

Atlas sorbitol is stable in the dry state or in aqueous solution. It is not attacked by cold dilute acids or alkalies, nor by atmospheric oxygen in the absence of catalysts. Atlas sorbitol is stable in the presence of many drugs and pharmaceuticals which are incompatible with other polyols.

**FACT:****Sorbitol leads in uniformity**

Polyols made from a wide variety of raw materials are bound to vary widely from batch to batch. But sorbitol, made from sugar, always is uniform.

**FACT:****Sorbitol leads in economy and availability**

On price stability alone, sorbitol rates the "best buy" in polyols. Its price trend through the years has been downward. And because sorbitol is made from sugar, it is available in almost unlimited quantities.

Write today for the valuable 22-page Atlas sorbitol book containing charts, usage tables, and other helpful data. Personal technical assistance is available at your request.



Industrial Chemicals Department

**ATLAS POWDER COMPANY**

WILMINGTON 99, DELAWARE • OFFICES IN PRINCIPAL CITIES

ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

# Close Tolerances

## at the BS&B Climax Controls Factory

You demand controls designed and engineered by men thoroughly familiar with your industry. You demand the manufacturer be stingy with his tolerances . . . a stickler for exacting accuracy for you know that on such accuracy may depend your cost of operation—the safety of your equipment—the lives, even, of your people.

That's why we know we're being complimented when so many precision minded industries rely so completely on BS&B Climax Controls—they trust our knowledge and above all, our care in manufacture. BS&B Climax engineers protect this enviable reputation by constantly watchdogging the production of the Climax instrument that safeguards your control of pressures, temperatures, levels and flow.

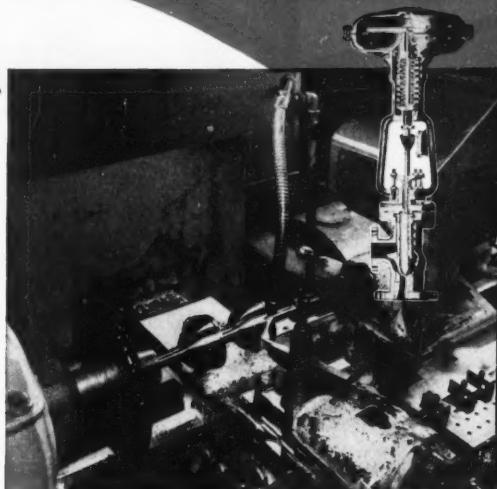
And safety is not the only benefit Climax Controls may give you. Wide awake industries have found that Climax valves, controls, regulators or relays can in many cases . . . (a) eliminate manual operations, (b) vary, increase or multiply the functions of equipment, (c) supply additional safety factors, (d) reduce supervisory requirements.

## Generous Control Performance

Performance and reliability show up in the manufacturing of Climax Controls. Here are a few of the steps that enable us to turn out over 12,000 different parts used in the assembly of various Climax Controls.

- 1 **"Peas-in-a-pod" Uniformity.** An electronic-hydraulic duplicator reproduces every inner valve from a template within .001" tolerance, assuring uniform inner valve characteristics.
- 2 **Part of the modern and orderly Climax Controls factory . . .** milling machines, deburring and grinding bench, drill presses and boring mill. Skilled and experienced operators contribute heavily to your control application where the name Climax appears.
- 3 **Applying Craftsman's touch to Mass Production.** For economy, which is passed along to you, Climax Controls are produced on an assembly line basis . . . for accuracy, which you enjoy in true performance, a Climax Control is never without the Craftsman's touch. Here a large multiple spindle drill works true bolt circles in a large body. A similar but smaller unit does the same job for smaller parts.

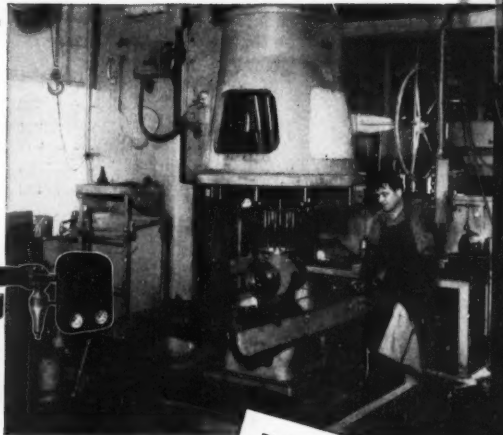
1.



2.



3.



**BLACK, SIVALLS & BRYSON, INC.**

Climax Controls Division  
7500 East 12th Street

Dept. 4-N11  
Kansas City 3, Missouri

**76 Climax Control Centers . . .**  
**Ask Your BS&B Man**  
Call on BS&B for confidential Climax Engineering Service. A Climax Engineer will help you work out your control problems and apply the information on the construction specifications and application of BS&B Climax Controls. Write for the Climax Controls Catalog.



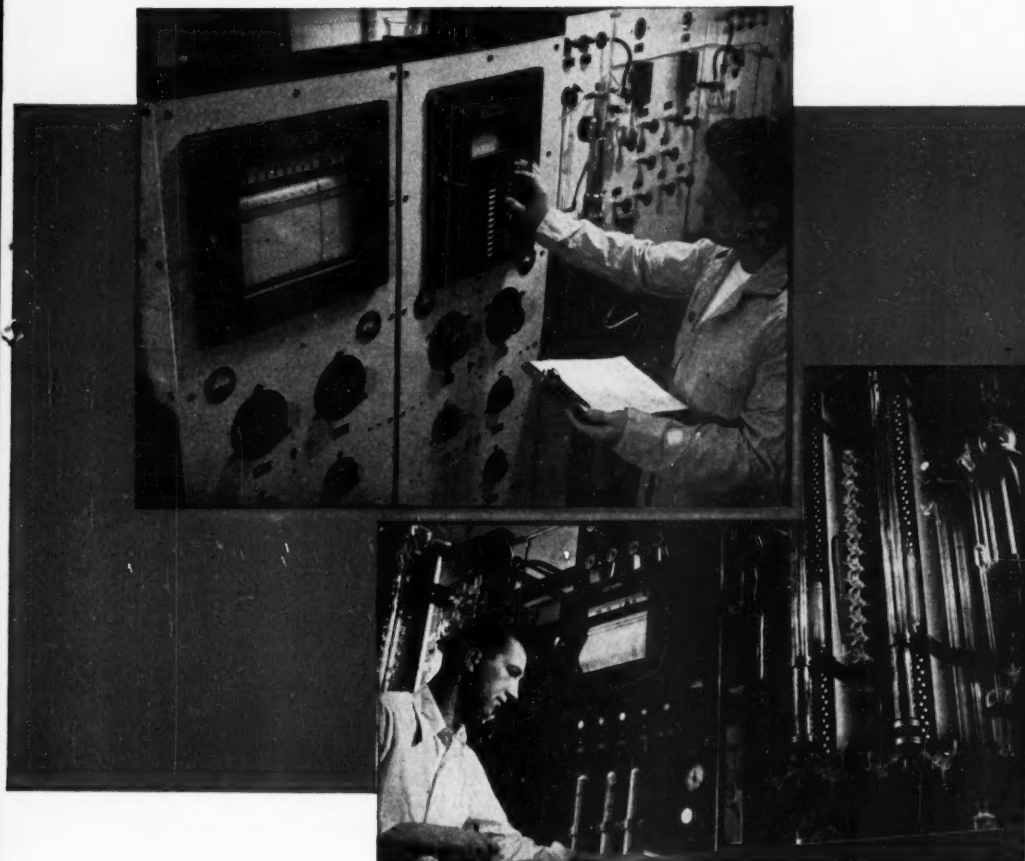


PILOT  
PLANT

On the  
threshold  
of process  
perfection...

**BROWN** *Instrumentation*

... is patterned to the exact requirements of individual plants and processes ... is the result of engineering and application know-how, with one responsibility from sensing elements to control valves ... is backed by a nation-wide field engineering and service organization.



PROVING processes in the pilot plant stage can save untold millions of dollars in "on-stream" operations. But bridging the gap between fluid ounces per hour in the laboratory and hundreds or thousands of barrels per hour in the plant takes considerable doing.

Thorough instrumentation in the pilot plant provides . . . (1) *a saving in scientific man-hours*, through the centralization of critical data which eliminates the hand logging of hundreds or even thousands of points . . . (2) *easy and rapid interpretation of data*, through automatic coordination and recording in chart form . . . and (3) *process simplification*, through a com-

plete understanding of control problems well in advance of full-scale operations.

Add to these advantages the fact that, with instruments, pilot studies are accomplished in much less time . . . for instruments *accelerate* research. Investigate the wide application possibilities of Brown Instrumentation. Our local engineering representative is qualified to discuss your requirements . . . and he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO.,  
Industrial Division, 4478 Wayne Ave., Philadelphia 44, Pa.

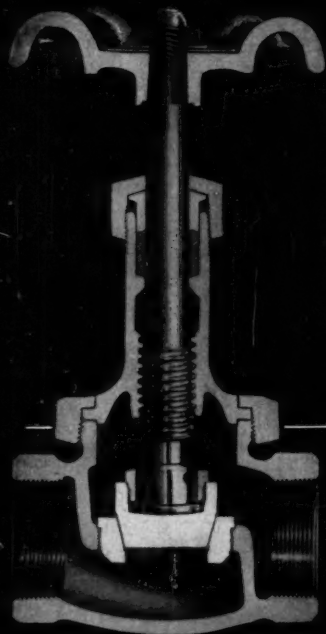
MINNEAPOLIS  
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BROWN INSTRUMENTS

*First in Controls*



*Important Reference Data*

WRITE FOR A COPY OF 64-PAGE BULLETIN NO. 15-14, "INSTRUMENTS ACCELERATE RESEARCH"... AND NEW BROCHURE, "TOMORROW IS TODAY."



# BRONZE

**COMPLETE LINES OF BRONZE VALVES AND PIPE FITTINGS** are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns, including Walseal® Bronze Valves and Fittings for making Silbraz® joints.

Walworth also manufactures complete lines of valves and fittings — including Lubricated Plug Valves — made of steel, iron, and special alloys as well as bronze.

Walworth-made valves, pipe fittings, and pipe wrenches, total approximately 50,000 items—all sold through distributors in principal centers throughout the world.

Walworth engineers will be glad to help you with your problems. For full information call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



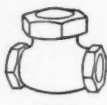
GATE



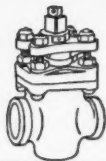
GLOBE



ANGLE



CHECK



LUBRICATED PLUG

Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

## WALWORTH

*Manufacturers since 1842*

**valves . . . pipe fittings . . . pipe wrenches**

**60 East 42nd Street, New York 17, N. Y.**

**DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD**

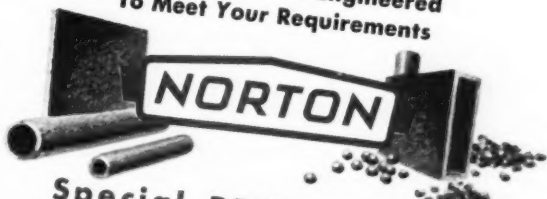
How Norton Helps You Get

**Better Products**

**Greater Production**

**Lower Operating Costs**

With Refractories Engineered  
To Meet Your Requirements

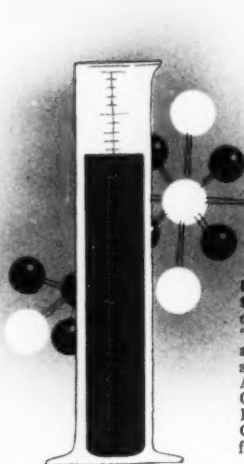


**Special REFRACTORIES**

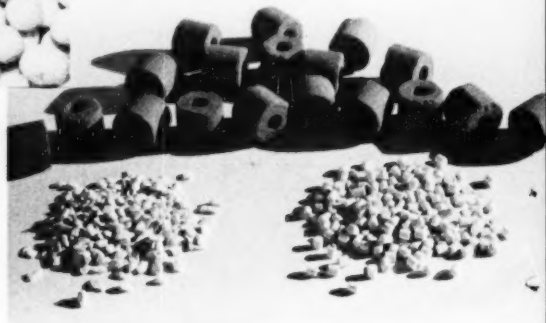
MAKING BETTER PRODUCTS TO MAKE OTHER PRODUCTS BETTER

**... For the Chemical Industry**





**NORTON SPHERICAL CATALYST SUPPORTS** give you the benefit of uniform beds, and a choice of "structure-controlled" surfaces and sizes from  $\frac{1}{8}$ " to 1". Other supports are rings and pellets. Available in ALUNDUM, CRYSTOLON, MAGNORITE, FUSED STABILIZED ZIRCONIA and MULLITE refractories.



## You Improve Processes, Increase Yields or Cut Costs When Norton SPECIAL Refractories are ENGINEERED for You

In your business, you keep going ahead *only* when you keep looking ahead. So, research into new ways of turning out more and better products at lower unit costs is always important to you.

Your job of looking ahead will be much easier and more rewarding with Norton Refractory Research working for you. For 40 years, we have helped many chemical processing firms solve high temperature problems complicated by chemical, electrical, and physical variables. We could tell you how we helped them. But, most of our work has been on a confidential basis. No doubt, you'd prefer us to work that way with you.

### WHAT ARE YOUR PROBLEMS?

Are you looking for better catalyst supports? Are you interested in refractories that will let you increase your processing temperatures? Are you having trouble with porous mediums for filtration, diffusion or aeration? Are you bothered by short-lived refractories in your electric furnaces? Do you want to lengthen the life of your laboratory ware?

If you answered "yes" to any of those questions, Norton Refractory Research can be a big help to you. Let's see why.

### NORTON CATALYST SUPPORTS HAVE CONTROLLED STRUCTURE

To what degree do you want your catalyst to adhere to the surface of your supports?

Thanks to Norton Company's patented method of controlling porosity, you can specify exactly what you need.

Take Norton spherical supports, for example. Suppose you want maximum catalyst adherence to surface. You specify our *medium-porosity* spheres. Their porosity ranges from 30% to 35%, with open pores on the outside surface only. On the other hand, let's say you want uniform impregnation of the entire support. Then, you specify our *high-porosity* spheres to get greater deposition of your catalyst. Their porosity ranges from 42% to 47%, with open pores throughout the spheres. Low-porosity spheres also available if desired.

Both types of Norton spheres are available in diameters from  $\frac{1}{8}$ " to 1". They provide you with such a uniform bed that channeling and pressure drop are reduced to a minimum.

Other Norton catalyst supports include pellets and rings in diameters from  $\frac{1}{8}$ " to 2".

Materials used in Norton catalyst supports are ALUNDUM\*, CRYSTOLON\*, MAGNORITE\*, FUSED STABILIZED ZIRCONIA, and MULLITE refractories. Each material has its own special properties as a catalyst support. All have the chemical stability and purity that eliminate contamination of both catalyst and end products. High refractoriness and resistance to abrasion contribute to extra long service life.

Norton ALUNDUM Catalyst Supports, in particular, are cur-

rently in great demand. They are being used with great success in the manufacture of phthalic anhydride and ammonia and in reforming natural gas. Containing 77% to 89% alumina, they are outstanding for their chemical stability and resistance to abrasion.

Norton ALUNDUM Heat Exchange Pebbles are another product of Norton Research. Because of their high alumina content (95 to 99%), they stand up under alternating oxidizing and reducing atmospheres at high temperatures. Their high resistance to abrasion makes them ideal for heat exchange beds of either static or moving type.

### NORTON STABILIZED ZIRCONIA STANDS 4700° F TEMPERATURE

Here's real evidence that Norton Refractory Research can help you look ahead to the higher temperatures that mean greater yields and increased efficiency.

Norton Company was the first to bring fused stabilized zirconia out of the experimental stage early in 1951 . . . and offer it in commercial quantities. Since that time, it has proved itself in many processes.

No other refractory is so chemically stable at such high temperatures under both oxidizing and reducing conditions. In gas synthesis processes, for example, furnaces lined with Norton FUSED STABILIZED ZIRCONIA have stood up for long periods at temperatures approaching 4700° F in a neutral to slightly reducing atmosphere.

Other properties that have won interest in Norton FUSED STABILIZED ZIRCONIA are its low thermal conductivity (6.2 BTU in dense shapes at 2000° F), and its high electrical conductivity at elevated temperatures.

Bulletin No. 1409 gives you the whole story on the properties and applications of Norton FUSED STABILIZED ZIRCONIA.

Other Norton Refractories for furnaces include ALUNDUM, CRYSTOLON and MAGNORITE mixtures in brick, plates, tubes, and blocks. Each is engineered to fit your exact requirements.

Strange to relate, Norton Refractory Research has proved to a number of firms, attracted by the amazing properties of STABILIZED ZIRCONIA, that another engineered Norton special refractory was better for them.

It will pay you, too, to call on Norton Refractory Research to work with you.

### NORTON ALUNDUM POROUS MEDIUMS MAKE UNIFORM FLOW CERTAIN

Here, again, Norton Company's patented "controlled structure" process comes to your assistance.

REMEMBER, ALL THE NORTON SPECIAL REFRACTORIES DESCRIBED HERE CAN BE ENGINEERED TO FIT YOUR EXACT REQUIREMENTS—



In porous mediums for filtration, diffusion or aeration, you want to be sure of uniform flow. And you're always sure when you use Norton porous plates, tubes, discs or diaphragms. That's because their pores are uniformly distributed, in the size and open-pore ratio you need.

Norton seamless porous tubes, for example, are now being widely used for filtering water, solvents, cutting oils, wine, food oils and other liquids . . . for reclaiming cleaning fluids . . . in boiler feed water treatment . . . and for handling industrial oil wastes. Their seamless construction makes porosity uniform . . . maintains constant air or liquid pressure . . . lets backwashing do a more thorough cleaning job.

Of equal importance to you is the material used in Norton porous mediums. It's Norton ALUNDUM aluminum oxide . . . a tough abrasive and a chemically stable refractory at the same time.

Because of these properties, Norton ALUNDUM porous mediums survive conditions that shorten the life of other products. They are relatively unaffected by the acid or alkaline conditions normally encountered in commercial applications. Their great strength and extreme resistance to abrasion give them extra long life. Their resistance to properly applied temperatures up to 1850° F permits you to burn off organic matter if it clogs the pores.

Custom-made in the sizes and shapes you need, Norton ALUNDUM porous plates, tubes, discs or diaphragms will give you the uniform flow you want at the lowest possible annual cost. Bulletin No. 140 tells you more.

#### NORTON ELECTRIC FURNACE SHAPES GIVE TOP PERFORMANCE LONGER

If electric furnaces are as important to you as they are to us, you'll get more help than you can imagine out of Norton Refractory Research.

They're so important in so many vital phases of our own business that we're always looking for new ways of improving their performance.

We have had great success with Norton ALUNDUM cores, muffles, and tubes. There are four reasons why:

1. Norton ALUNDUM furnace parts are made of fused aluminum oxide that is 99%  $Al_2O_3$ .

2. Such purity results in a high degree of stability and chemical inertness. This prevents reactions with resistor materials as well as crucibles and boats of platinum, nickel or fused oxide.

3. Norton ALUNDUM furnace shapes are excellent thermal conductors. This means small temperature gradient between the resistor and furnace interior.

4. Norton ALUNDUM refractory is a good electrical insulator up to relatively high temperatures. One test on an ALUNDUM tube shows a direct current resistance of  $7.5 \times 10^7$  ohms/cm<sup>2</sup> at 600° C. This value did not fall off materially until a temperature in excess of 1600° C was reached.

Where high thermal conductivity and resistance to heat shock are more important, Norton CRYSTOLON shapes offer advantages over ALUNDUM shapes. They are limited, however, to resistors of nickel chromium alloys and to temperatures not exceeding 2100° F.

Norton FUSED STABILIZED ZIRCONIA shows great possibilities as induction heating elements in ultra high frequency induction furnaces and as resistors in high temperature resistance furnaces.

Bulletin No. 458, titled "The Construction of Electric Furnaces for the Laboratory" is yours for the asking.

#### NORTON ALUNDUM LABORATORY WARE OFFERS YOU MANY ADVANTAGES

No other laboratory ware combines so many of the properties you want for your laboratory development, experimental or analytical work.

1. It's chemically stable. Made of fused alumina containing 85%  $Al_2O_3$  (99% in special mixtures), it is not attacked by any organic solvent. Only hydrofluoric acid, concentrated phosphoric acid and strong, hot caustic solutions affect it.

2. It stands temperatures up to 1900° C. So, you can melt pure metals in thick-walled Norton ALUNDUM crucibles. You can also ignite extracted residues in Norton ALUNDUM thimbles.

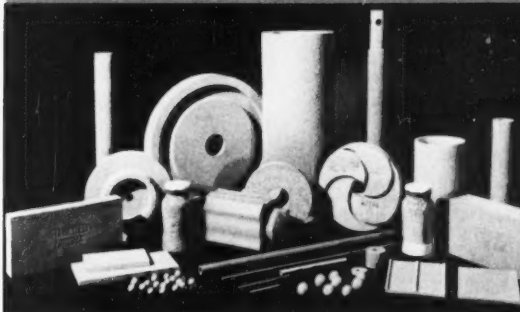
3. It's easy to clean. You just dip it briefly in a fairly strong acid solution (not phosphoric, hydrofluoric or concentrated sulphuric); wash with water, and ignite to constant weight.

4. For filtering, it comes in four degrees of permeability to retain 0.1, 5.0, 20.0 and 30 microns particle sizes.

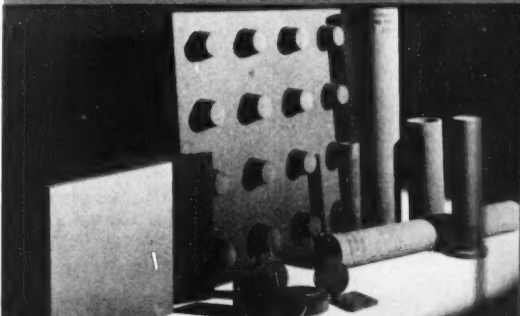
Bulletin No. 793 tells you all about Norton ALUNDUM Laboratory Ware. Get it from your regular source of laboratory ware, or write us direct.

LET'S TALK IT OVER.

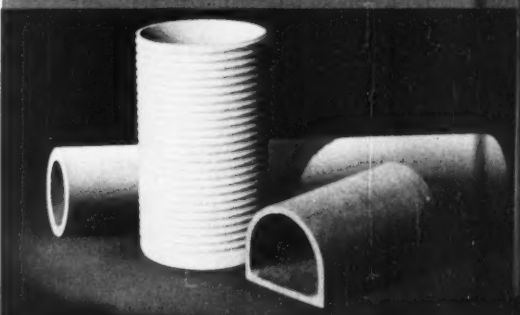
\*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



NORTON REFRACTORY SHAPES FOR REACTION FURNACES come in bricks, plates, tubes and blocks in ALUNDUM, CRYSTOLON, MAGNORITE and FUSED STABILIZED ZIRCONIA.



NORTON ALUNDUM POROUS MEDIUM comes in plates, tubes, discs and diaphragms engineered to fit your exact filtering, diffusing or aerating requirements.



NORTON ELECTRIC FURNACE REFRACTORIES come in cores, tubes, and muffles made of ALUNDUM and CRYSTOLON refractories.



NORTON ALUNDUM LABORATORY WARE, famous for its chemical stability, high refractoriness and uniform porosity, comes in crucibles, ignition capsules, incinerating dishes, cones, dishes, discs, thimbles and boats in all sizes and shapes.



## **SOME STRAIGHT FACTS ABOUT YOUR REFRACTORY PROBLEMS**

Whatever your refractory applications may be, here's one basic fact to remember:

*There is no such thing as a universal refractory.*

Putting it another way, *no one refractory* combines in the highest degree such properties as resistance to extreme heat, thermal shock, abrasion and chemical reactions — plus good thermal conductivity, insulation and various special electrical properties.

That's what complicates your choice of refractories. And that's why you need refractories that are expertly engineered to meet your own particular combination of needs.

### **PUT NORTON RESEARCH TO WORK FOR YOU**

As industry advances, refractories must constantly meet new problems in processing conditions. To these problems Norton Refractory Research applies the accumulated knowledge and skills of over 40 years' experience.

It is a continuous, full-time job, and a productive one — for it has come up with many quality-boosting, money-saving answers, in many industrial fields.

That is why it will pay you to make Norton Refractory Research a working partner in finding the right answers to your own refractory problems. For quick action, just contact your Norton Refractories Representative. Or write to Norton Company, Refractories Division, 406 New Bond Street, Worcester 6, Mass.



### **Special REFRACTORIES**

*Making better products to make other products better*

FORM NO. 1694-52-2

# How PROSPEROUS Is The USA?

**Just how prosperous are the people of the United States?**

The sole purpose of this message is to help clear up the confusion and controversy that surrounds this important question.

To find out how much prosperity, or material well-being, the people of the United States now enjoy, it is necessary to get answers to these questions:

1. As compared with other times, what is the total amount of goods and services that we have available for our enjoyment?
2. How great, on the average, is the share of each American in this prosperity?
3. How does our prosperity compare with that of other nations?

## National Product at Peak

The government statisticians who do the bookkeeping for the nation produce a figure called the Gross National Product. It is supposed to be the total obtained when you multiply the amounts of everything we produce by the prices of everything produced. This year the GNP, as it is commonly tagged, will add up to something like \$345 billion.

Since this will be the highest total that GNP has ever attained, some people will acclaim it as evidence that we now are enjoying the greatest prosperity on record.

The GNP, however, is not an accurate yardstick of prosperity. It may go up because of price inflation alone without any increase at all in the output of goods and services. Also the GNP includes very large amounts of goods and services, such as those for the military, which are in fact a result of misfortune rather than of a condition that might properly be called prosperity. Moreover, there is no deduction from the GNP to make allowance for the equipment that is worn out in producing it.

## Little Recent Progress

When we make adjustments such as these—to find out how much of our production really is available for the use and enjoyment of the civilian population—the *adjusted* national product since the beginning of World War II comes out about as follows. The effects of price inflation have been removed from these figures.

YEAR	ADJUSTED NATIONAL PRODUCT	
	Billions 1951 Dollars	Index (1946 = 100)
1940	\$176.2	76
1946	232.5	100
1947	240.7	104
1948	244.3	105
1949	239.7	103
1950	260.9	112
1951	267.9	115
1952	264.3	114

From this table the fact stands out that progress in raising our level of prosperity has been halting. What progress we have made came in a few dramatic increases before or after a military build-up. Aside from those, the progress has been fairly slow. This year, 1952, it has been particularly discouraging.

Again, when account is taken of the number of people who must share in the goods and services that are available, our progress is even less marked. This is shown by the following table which gives the share of the average American in the national product. This, as the table indicates, is arrived at simply by dividing the total of available goods and services by the population on hand to share in them.

YEAR	POPULATION Millions	ADJUSTED NATIONAL PRODUCT Billions 1951 Dollars	ADJUSTED NATIONAL PRODUCT Per Person
1940	132.0	\$176.2	\$1,335
1946	141.3	232.5	1,645
1947	144.0	240.7	1,672
1948	146.6	244.3	1,666
1949	149.2	239.7	1,607
1950	150.6	260.9	1,732
1951	154.4	267.9	1,735
1952	156.9	264.3	1,685

Here it is clear that we have made little or no headway since the end of World War II.

### U.S. Compared to Other Nations

Although we are making slow progress in increasing our prosperity, as measured during recent years by the amount of goods per person, we still are by long odds the most prosperous people on earth. This can be seen from the following table. It offers a rough measure of how the adjusted output of goods and services per person in the United States compared in 1951 with that in a number of other countries:

COUNTRY	PER PERSON
United States .....	\$1,735
Canada .....	1,231
United Kingdom .....	614
France .....	510

To figure more closely "How Prosperous is the U.S.A.?" we must answer a number of

other questions. One of the most important will be the subject of a later editorial in this series. It is "Who Gets What?" How have various income classes and occupational groups shared the total available goods?

Another question that has a basic bearing on the quality and durability of our prosperity is "How fast are we using up irreplaceable natural resources, such as oil, iron ore, and copper, to sustain it?" Any attempt to deal with this very complicated question must also be deferred.

### A Problem for the Future

In the meantime, however, key facts about our prosperity are that:

1. Most of the increase in the nation's total production in recent years has been to meet military requirements rather than to improve the American standard of living.

2. The increase in the supply of goods and services actually available for the average American has been slow and halting.

3. We Americans are still extremely well provided with the good material things of life, as compared with peoples in other lands.

These three facts bring to mind a whole series of policy questions. What can be done to speed up progress in improving our prosperity? What—to repeat the question discussed in the previous editorial in this series—can be done to make our prosperity less precarious?

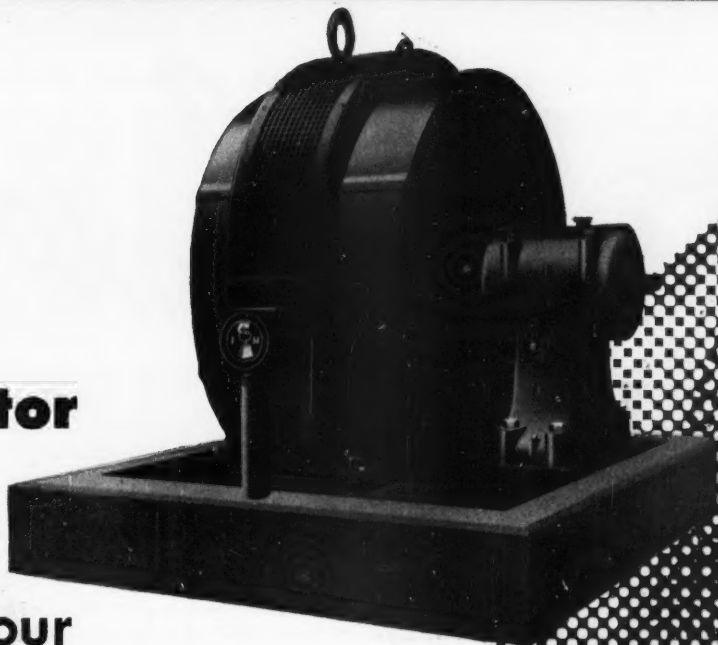
Here, however, the purpose is not to prescribe. It is simply to indicate as accurately as it can be done in a brief article the actual state of the nation's prosperity.

In doing this much, it can properly be remarked that the record presents to the American economy both a problem and an opportunity of surpassing importance. It is that of building a prosperity that will be both more progressive and more secure than any we have known in recent years. In the light of what clearly remains to be done, we shall make a grave mistake if we use up any of our energy in congratulating ourselves on the relatively meager progress here recorded.

**McGraw-Hill Publishing Company, Inc.**



this  
factor  
figures  
in your  
future



Whatever your drive problems, the motor with the Fairbanks-Morse Seal can be an important factor in the future success of your motor-driven equipment.

For example, when you need synchronous machinery, look for the F-M Seal—as have users of over 5,000,000 horsepower of this type of equipment. That Seal is your assurance of pioneered improvements, proved design, quality manufacture and top performance—factors to figure in your future.

When you look for electric motors, look for the Fairbanks-Morse seal. For over 120 years it has stood for the finest in manufacturing integrity—to all industry. Fairbanks, Morse & Co., Chicago 5, Illinois.



**FAIRBANKS-MORSE**

*a name worth remembering when you want the best*

ELECTRIC MOTORS AND GENERATORS • MAGNETOS • FARM MACHINERY  
DIESEL LOCOMOTIVES AND ENGINES • PUMPS • SCALES  
HOME WATER SERVICE EQUIPMENT • RAIL CARS



INDUSTRY'S  
ALL-TIME FAVORITE  
FOR LONG RANGE

*Economy*



JENKINS  
Fig. 106-A  
Renewable  
Composition Disc

BRONZE  
GLOBE VALVE

150 lbs. Steam  
200 lbs. O.W. G.

Take a Jenkins Fig. 106-A apart. It's easy to see why it is industry's all-time favorite. Note the liberal dimensions of body and bonnet casting — the heavy, manganese bronze spindle, with more strong threads in contact with the bonnet, regardless of spindle position. See how the slip-on, stay-on disc holder fully protects the edge of the disc, prevents creeping, flaking, or cracking.

Every part, from perfect grip, heatproof handwheel to pipe ends, reflects the designing skill of Jenkins valve specialists. There's a good reason. Jenkins Bros. introduced the *first* renewable composition disc valve, — is today the only manufacturer of both valves and discs.

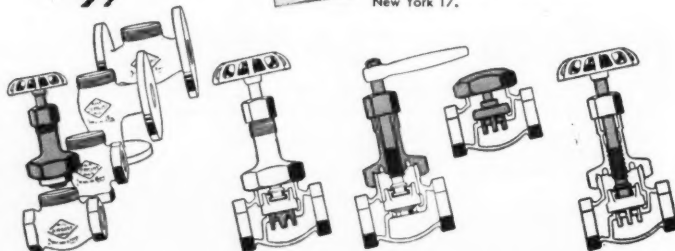
Fig. 106-A not only looks better — it proves out better in performance. In any comparison, its long life, low upkeep record has never been surpassed. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

## JENKINS LOOK FOR THE DIAMOND MARK VALVES



GET THIS FOLDER — Gives details of Fig. 106-A design, and "family" interchangeability. Ask your Jenkins Distributor for Form 189-A, or write Jenkins Bros., 100 Park Ave., New York 17.

Fig. 106-A "Family" Interchangeability meets 90% of your valve needs with a small inventory of parts. Start with the standard Fig. 106-A. Trimming is interchangeable in Globe or Angle body, screwed or flanged. With a few parts, quickly-assembled combinations provide a Lift Check, a Spring-loaded Check, and valves for Stop and Check, Quick-opening, or Throttling service.





## Dependable Source for Chemical Raw Materials



1 Add equal amounts of your product to each jar.



2 Add small quantity of Carbose to one and dissolve.



3 Add carbon suspension to each jar.



4 Place a cloth swatch in each.



5 Cap jars and shake for 10 seconds.



6 Withdraw swatches.



7 Place swatches in rinse water.



8 Rinse by shaking for 5 seconds.



9 Remove swatches . . . and COMPARE!

Make Wyandotte's 2-minute Soil Deposition Test yourself. See what Carbose can do for your detergent product!

### BULLETIN BOARD

#### Dicol®:

This mixture of diglycols, predominantly diethylene glycol, has shown outstanding efficiency in plasticizing and humectant applications . . . plus up to 20% savings! Write for samples, data.

#### Purecal:

Recent advances in GR-S compounding and processing, using this whitest pigment extender known (Wyandotte's precipitated calcium carbonate) warrant cost comparison with cheapest natural-rubber formulas. Other profitable applications: paint, paper, ink manufacture.

#### Caustic Soda:

Some cleaning compound manufacturers are finding that powdered caustic has some advantages over flake. Since other ingredients are powdered or fine-granular, a dust-suppressing oil is needed anyway; and the powdered caustic does not tend to segregate. Ask for trial quantity.

#### Soda Ash:

Supply of soda ash is adequate for the present; and we're expanding production to meet growing needs of old and new customers.

## ONE PERCENT Wyandotte Carbose improved detergency up to 40%!

Reduction in the cost of raw materials as high as 50% by use of CARBOSE\* formulations . . . that's the kind of report we're getting on CARBOSE from the field!

It's no surprise. In carefully controlled tests on cotton, this outstanding "detergency promoter"—as little as 1%—increased soil removal and whiteness retention as much as 10% to 40% in different formulations with synthetic detergents and builders. CARBOSE promotes long-lasting suds, reduces skin irritation—ideal for dishwashing, car-washing and other compounds where emolliency is desirable.

This superior product is typical of Wyandotte. For the quick facts on

current production, improvement and development of other Wyandotte chemicals for the process industries, read the "Bulletin Board," left. For samples with which you can make the above test yourself or for more complete information, write—Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in Principal Cities.

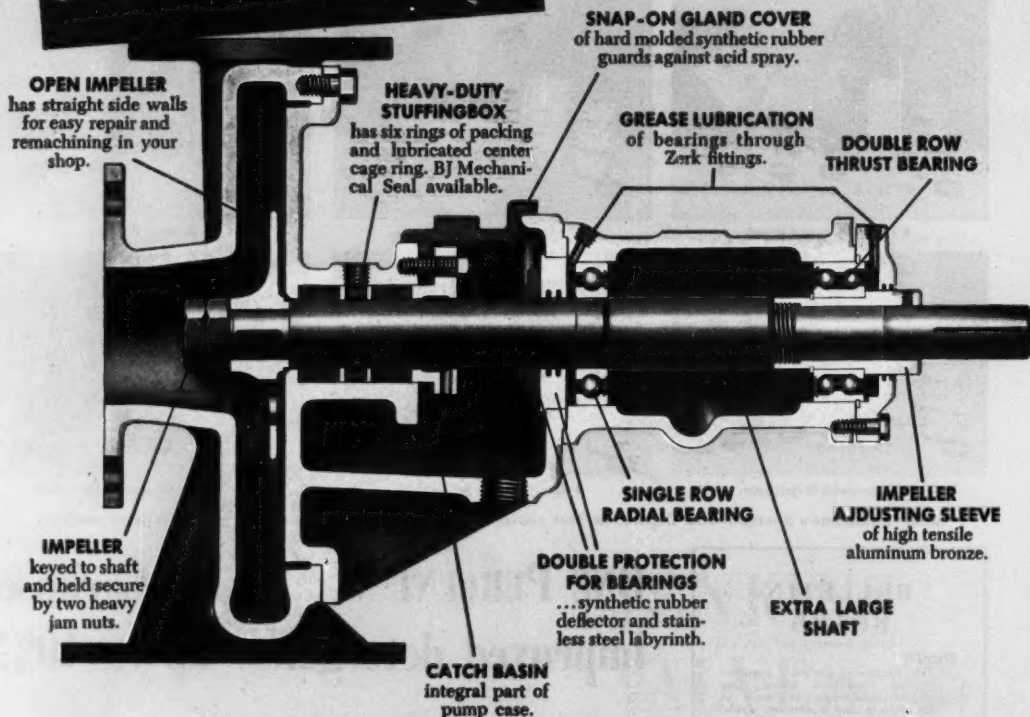
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 **Wyandotte**  
CHEMICALS

HEADQUARTERS FOR ALKALIES

# NEW BJ CHEMICAL PUMPS

## Here are chemical



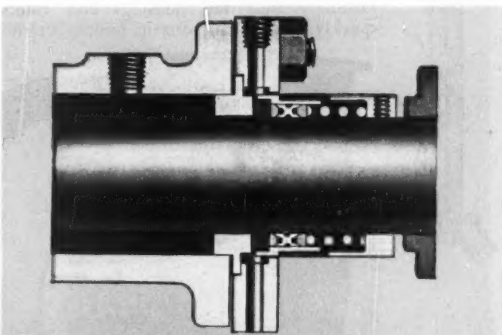
**You've asked for them...  
now BJ introduces these  
special construction features!**

- *Quick and easy dismantling* for inspection and repair without disturbing piping or driver.
- *All parts interchangeable* except pump case and impeller. Four different pump sizes can be used on one basic stuffingbox and bearing bracket assembly.
- *Corrosion-resistant catch basin*—integral part of pump case—guards bearing bracket and base plate from corrosive leakage.
- *Adjusting sleeve* permits compensation for impeller wear—allows easy adjustment without dismantling.
- *Grease lubrication* gives bearings greater protection against acid fumes. Deflector and labyrinth provide double protection against liquid entrance.
- *Cored passages* through impeller web keep stuffingbox under suction pressure.

# pumps engineered to your demands...

*You—the chemical pump user—dictated the design of these new BJ Chemical Pumps. Before Byron Jackson engineered these new BJ models, chemical pump users were asked what features were wanted most. Now these improved features are yours in the new BJ Chemical Pumps. Four pump sizes are available (1", 1½", 2" and 3") with capacities to 450 gpm and heads to 100 feet.*

**BJ Mechanical Seal also available for protection against leakage.** BJ's Type "A" Mechanical Seal is designed especially for the particular demands of chemical pumping. It replaces the packing and provides positive protection against leakage to the bearings or contamination of the pumped liquid. All major parts of this BJ-designed seal are effectively isolated from contact with pumped liquid. Available as special construction, the BJ Mechanical Seal will save you maintenance time and money by eliminating frequent repacking.



**YOU BENEFIT FROM MAXIMUM INTERCHANGEABILITY OF PARTS!**

All parts except pump case and impeller are completely interchangeable. Four different size BJ Chemical Pumps fit one basic assembly! This means that only a few spare parts are needed to service a wide range of pumps.

**FOR MORE INFORMATION  
on these new pumps, write  
BJ Chemical Pump Dept. 5.**

**BJ makes a complete line of centrifugal  
pumps to answer your other pumping needs.**

**Byron Jackson Co.**

*Since 1872*

**P. O. Box 2017 Terminal Annex, Los Angeles 54, Calif.**

**OFFICES IN PRINCIPAL CITIES**

**"Buffalo"**

## Tips on Making Your Fans Last

### Specify RUBBER LINING For Your Corrosive Fume Fans—It Will Multiply Their Life

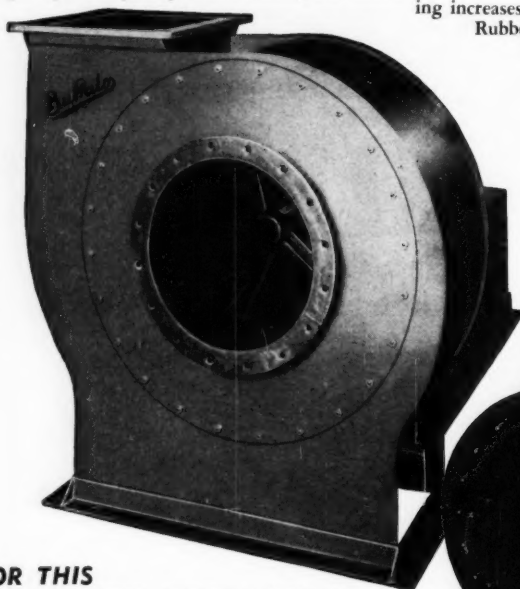
For any fan installation that is to handle corrosive fumes, take adequate precautions ahead of time—specify rubber lining. You will save money, fan repair troubles and valuable steel. Ordinary steel fan housings and rotors are quickly destroyed by certain fumes, but rubber coat-

ing increases fan life three to twelve times. "Buffalo" Rubber-Lined Fans have rubber "welded" to all interior parts by the "Vulcalok" process. No metal parts are left exposed.

Naturally, efficiency, smooth rotor balance and proper performance characteristics also enter into the choice of a good fume fan. We welcome your inquiries into the entire "Buffalo" line of fans, which have been proving themselves in the chemical industries for many years.



Above, showing how rubber lining protects all steel parts of the fan from fume corrosion.



#### WRITE FOR THIS HELPFUL INFORMATION ON FUME HANDLING!



Bulletin 2424-E contains construction and performance information on "Buffalo" Rubber-Lined Exhausters and their application. Yours for the writing!



**BUFFALO FORGE COMPANY**  
501 BROADWAY  
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK  
FIRST FOR FANS

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING

PRESSURE BLOWING  
AIR CLEANING

COOLING  
AIR TEMPERING

HEATING  
INDUCED DRAFT

FORCED DRAFT  
EXHAUSTING



A regular  
"busybody"

around your  
chemical plant

**Allis-  
Chalmers  
HD-5G**

1 cu. yd. Bucket,  
40 drawbar hp.  
Dumping Height  
— 9 ft., 1/4 in.



**Sticks Its Nose into Any Material-Handling and Excavating  
Work . . . And Gets the Job Done Fast**

**Interchangeable attachments include:** Special buckets — up to 2-yd . . . Bull-  
dozers for excavating and backfilling . . . Crane Hook for heavy lifting . . . Lift Fork  
for handling palletized loads . . . Trench Hoe for footings, pipe — other trenching.

**Fertilizer — Works right up on a big Stockpile**

to eliminate overhang . . . and scoops out a full cubic yard at a pass with standard bucket. Only a crawler tractor gives you the traction you need to handle this tough digging . . . and only this A-C crawler gives you 2-speed reverse and 1,000-hour lubrication of truck wheels to protect your working time, increase output.

**Coal — Stores, Compacts and Reclaims**

This flexible unit can build stockpiles in any available

space. Ability to spread and pack coal in thin, horizontal layers eliminates flues — the main cause of spontaneous combustion. Standard track shoe eliminates coal breakage. As coal is needed, the HD-5G quickly loads from stockpile to trucks. On short hauls, it dozes or carries coal directly to plant.

**Waste — Cleans Up and Loads**

Out in the yard, this busy tractor cleans up and loads industrial waste, excavates, trenches and backfills on new construction, spots cars, clears snow . . . handles many other jobs winter and summer.

Send coupon for free literature describing this one-tractor fleet.

**ALLIS-CHALMERS**  
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

**ALLIS-CHALMERS TRACTOR DIVISION**  
1127 South 70th St., Milwaukee 1, Wis.

Please send me literature on the Tracto-Shovel line:

☐ 1-yd. HD-5G ☐ 2-yd. HD-9G ☐ 3-yd. HD-15G ☐ 4-yd. HD-20G

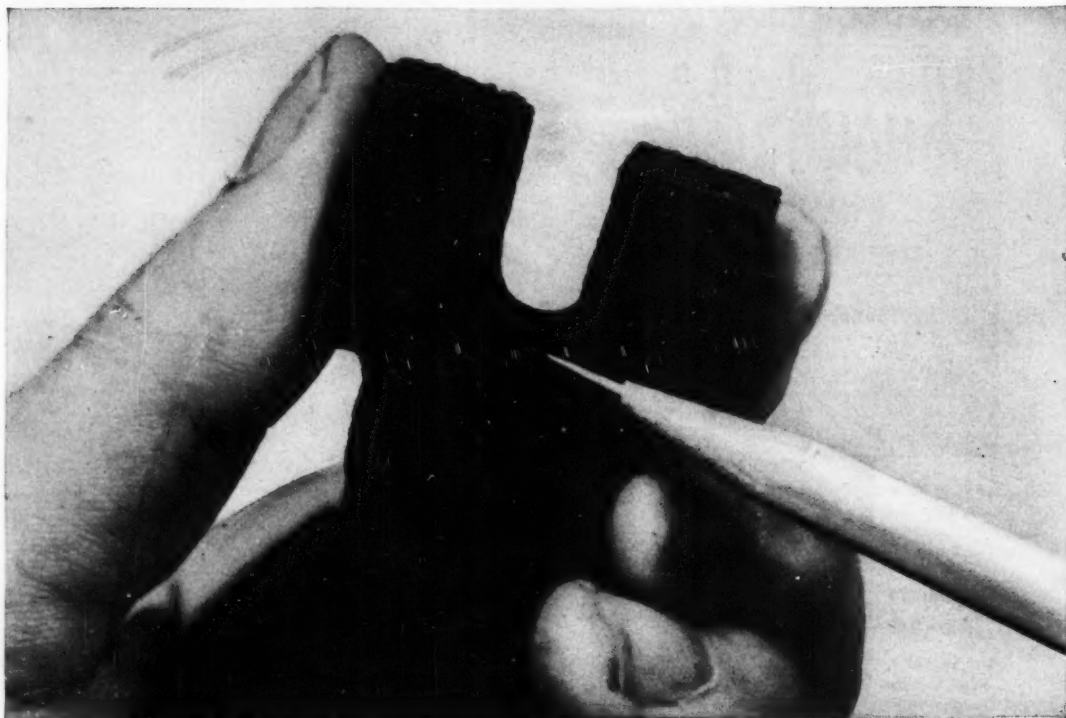
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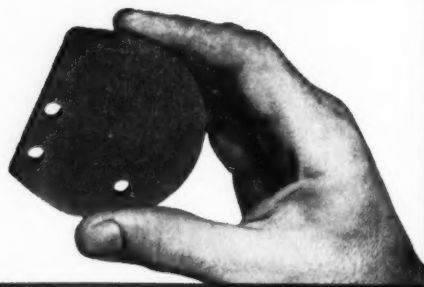
Company .....

Address .....

# Though heat is no factor... IT TAKES



**RAPID HEAT TRANSFER** is the prime function of this CARBOFRAX arc shield — i.e. to quickly dissipate the intense heat and quench the arc. Because CARBOFRAX refractories *do* conduct heat so rapidly (as rapidly as chrome-nickel steels at elevated temperatures) they are ideal for heat-exchange equipment of many types. They're used, for example, as radiant tubes, checkers, muffles, recuperator tubes, hearths, etc. It's no problem to make CARBOFRAX refractories in special close-tolerance shapes, including fitted joints, tubes, etc.



**Use Super Refractories by**

## **CARBORUNDUM**

TRADE MARK

*"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company.*

# A SILICON CARBIDE REFRACTORY TO STAND THIS ABRASIVE/CORROSIVE ATTACK

The slotted piece pictured opposite is a wire guide. It's used to support newly drawn steel wire as it passes along the bottom of tanks during zinc coating. Very little heat is involved, but, paradoxically, these guides are manufactured of virtually the most refractory material known — CARBOFRAX silicon carbide refractory. It seems to be the *only* material able to stand up under the combined cutting action of the wire and the corrosive action of the plating solution.

Here's why. Made from the same basic material as the well known abrasive products by CARBORUNDUM, CARBOFRAX refractories are very strong physically, and are the hardest, most abrasion-resistant materials commercially available. They will distinctly outwear metals and other normally durable materials — from room temperatures to 3000 F, and more.

## Examples of where CARBOFRAX refractories have licked abrasive and/or corrosive conditions

- In Cyclone Dust Collectors where the blast of millions of highly abrasive particles quickly cuts away other lining materials.
- In SO<sub>2</sub> Converters where the ducts are subjected to the scouring and acid action of high velocity SO<sub>2</sub> and SO<sub>3</sub> gases at 1100 F.
- In Coke Chutes and Hoppers which must withstand punishing cascades of sharp-edged coke — sometimes fiery hot.
- In Muriatic Acid Furnaces, hydrogen cyanide converters, sulphur burners and related equipment attacked by erosion and corrosion.
- In Billet Heating Furnaces where massive metal slabs are dragged over the floor, skid rails, or other bearing surfaces.

They have high chemical stability, and are inherently inert to all acids or acid fumes (except phosphoric and hydrofluoric) — even at temperatures far above those most metals will stand. However, they are no cure-all, and should be applied with caution where molten metallic oxides or molten bases are present. Under these conditions, other Super Refractories by CARBORUNDUM often prove better fitted.

For the full story on CARBOFRAX refractories (and other Super Refractories) — with data on strength, weight, thermal conductivities, etc. — get our booklet. It shows how these interesting materials have been used, where they've proved better than metals, refractories, and other materials. Why not check up? One of these products may have exactly the properties you can use.



Dept. H-112

Refractories Division, The Carborundum Company,  
Perth Amboy, N. J.

Send complimentary copy of Super Refractories booklet to:

Name

Position

Company

Street

City  Zone  State



**OIL-FREE COMPRESSORS**

**VACUUM PUMPS and BOOSTERS**

*Right above:* Five JOY WNO-112 Oil-Free Compressors for pressure-testing of food containers, oil-free ejection of metal stampings, paint spraying and general oil-free processing service.

*Left foreground:* Three JOY WGV-9 Vacuum Pumps handle the job of vacuum feeding of metal sheets.

*Left background:* These three JOY WGB-9's boost gas pressure for the burners in the soldering process.

**giving highly satisfactory service  
in a large Midwestern Can Factory**

For dependable *oil-free* air, day in and day out—as you may need it for any chemical processing or other special operation, or on that exacting instrument control job—there's a JOY OIL-FREE Compressor to meet your particular requirements. Dual Cushion valves, surface-hardened wearing areas and replaceable wearing parts are some of the exclusive JOY design features, and there's a complete line from 163 to 8800 CFM at pressures up to 100 PSI. A complete line of standard Compressors, Vacuum Pumps and Booster Compressors, too, for many different needs. Write for complete information, or . . .

*Consult a Joy Engineer*

Over 100 Years of Engineering Leadership

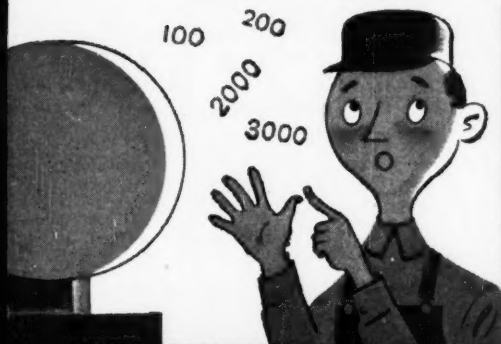
**JOY MANUFACTURING COMPANY**

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



# No "Waste-Time" Weighing...



WITH

## FAIRBANKS-MORSE

You speed your weighing operations with Fairbanks-Morse Bench Dial Scales. And that means there are no "bottlenecks" to hold up production all through your plant. Here's why:

With Fairbanks-Morse Bench Dial Scales, weights are read right at the point of the indicator. No time-wasting mental calculations are needed. You can weigh as fast as material can be moved on and off the scale platform. And, easy-to-read charts plus elimination of mental calculations reduce the possibility of human error . . . stop profit-eating weighing losses.

To eliminate "waste time" weighing in your operations, consult your Fairbanks-Morse weighing expert. Or, if you prefer, write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.



### FAIRBANKS-MORSE,

*a name worth remembering*

SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS  
HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS





# Distiller saves 4 ways

## THE PROBLEM:

To find a pump capable of handling an extremely viscous, corrosive syrup to the fourth stage of a multiple-effect evaporator. The pump not only had to resist corrosion but abrasion as well — since the syrup contained up to 35% solids.

## THE SOLUTION:

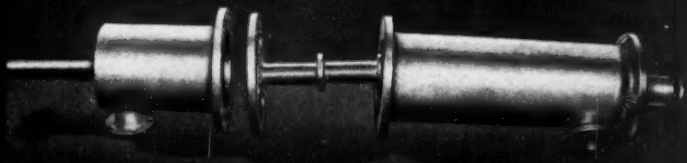
The installation of a compact, low-capital-investment Ampco Centrifugal Pump — the pump made of durable Ampco Aluminum Bronze Alloys that resist abrasion, corrosion, and cavitation-erosion — a special pump at a standard-pump price.

## THE RESULTS:

More than a year of day-in, day-out service proved the dependability and efficiency of Ampco Centrifugal Pumps.

The corrosion problem is solved. The pump shows practically no signs of wear — despite the high percentage of abrasive solids it handles. Power costs are  $\frac{1}{2}$  less. Space savings are tremendous. And process efficiency is improved — shutdowns are infrequent, minimum cleaning is required, because the pump maintains a constant liquid level in the evaporator tubes.

Ampco Centrifugal Pump  
installed in Foods and  
Feeds Department, Joseph  
E. Seagram & Sons, Inc.  
Distillery, Lawrenceburg,  
Indiana.



Outside and internal sections of a 10" Barometric Condenser.

1. Uses 66% less power
2. Cuts space requirements
3. Improves process efficiency
4. Eliminates weekly pump maintenance

... with Ampco Centrifugal Pump made of

## AMPCO\* BRONZES

— resistant to abrasion, corrosion and cavitation-erosion

Ampco engineered aluminum bronze alloys have high resistance to corrosion, erosion and abrasion.

That's why you find them used in both the process industries and marine service — used for tanks, pipe, fractionating towers, bubble caps, separators, condenser water boxes, agitators, stills, etc.—wherever there's a need for high resistance to these thieves of production time and money.

That's why Ampco Centrifugal Pumps save you money when the going is tough. They're the pumps made from Ampco — the pumps that resist the destructive action of corrosion, abrasion and cavitation-erosion.

Ampco aluminum bronzes make good where other metals fail. Perhaps they can help you. They're available in a wide variety of forms — sheet, plate, extrusions, pipe, tubes, fasteners, etc. They can be easily fabricated with Ampco-Trode® electrodes. Consult your nearest Ampco Field Engineer or write us for further information.

*Tear out this coupon and mail today!*

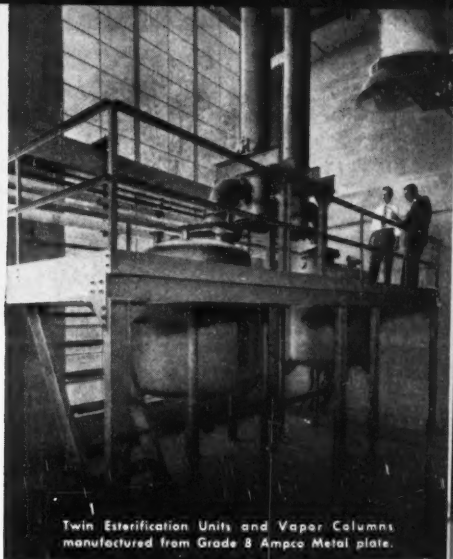
\*Reg. U. S. Pat. Off. Ampco Metal, Inc.

### Ampco Metal, Inc.

MILWAUKEE 46, WISCONSIN

West Coast Plant —

BURBANK, CALIFORNIA



Twin Esterification Units and Vapor Columns manufactured from Grade 8 Ampco Metal plate.



Sulfuric acid sludge tank, made of Grade 8 Ampco Metal plate under construction at large Pacific Coast Refinery.

AMPCO METAL, INC., Dept. CE-11, Milwaukee 46, Wis.

- ☐ Yes, I'm interested in Ampco Centrifugal Pumps. Send me literature.
- ☐ Send me information on the application of Ampco Aluminum Bronzes for corrosion-resistant service in the Process Industries.

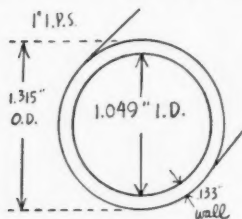
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Company Name.....

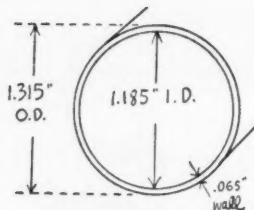
Company Address.....

City.....(.....) State.....

# here's what you gain with stainless schedule 5 pipe



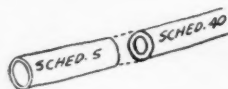
heavy wall  
Schedule 40



light wall  
Schedule 5



You save money. Schedule 5 pipe costs about half as much per foot as Schedule 40.



Schedule 5 has the same O.D. as Schedules 10, 40 and 80—for hook-up with existing lines as well as for new installations.



20% to  
27% greater  
capacity

Its larger I.D. increases flow and capacity in pipe-lines, exchangers and other equipment.



It's lighter.  
This means  
quicker and easier  
installation.



You can save substantially on valves, fittings, weld rods, etc., because smaller O.D. material can frequently be used. Tubing sizes can now be replaced with light wall pipe . . . for ready hook-up with standard valves, pumps, and other equipment normally manufactured in pipe sizes.



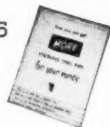
Fittings as well as stocks of Schedule 5 pipe are carried by conveniently located Carpenter distributors.

**Specify Schedule 5 pipe . . . it saves dollars . . . and makes a lot of sense!**

**THE CARPENTER STEEL COMPANY**  
Alloy Tube Division, Union, N. J.

Export Dept.: The Carpenter Steel Co., Port Washington, N.Y. "CARSTEELCO"

Data Sheets give you complete information about Carpenter Schedule 5 Stainless Pipe. Write for your personal copy.



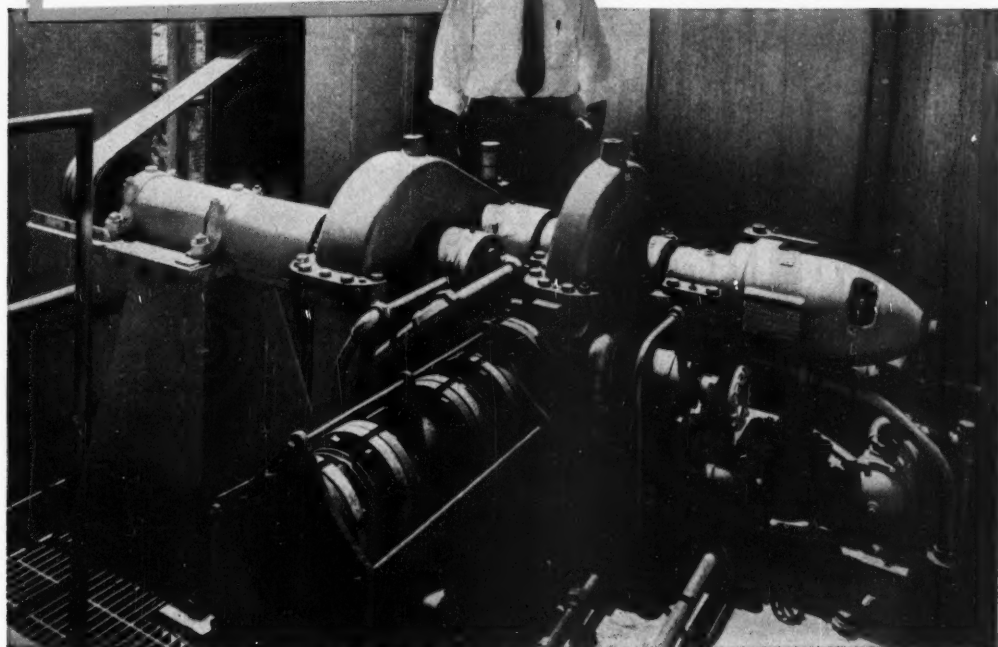
# Carpenter

## STAINLESS TUBING & PIPE



- guaranteed on every shipment

Where dirt, dust and corrosion are a problem...



## **TYPE E** turbines can handle it!

Spencer Chemical Company of Pittsburg, Kansas, has a total of ten 47-hp Type E turbines for driving blowers. Units are mounted outdoors on structural steel and are exposed not only to the elements, but to a corrosive ammonium-nitrate atmosphere.

Continued satisfactory operation of the turbines under these conditions is proof that the Type E can "take it" . . . proof that Type E construction keeps foreign matter out . . . proof that materials used resist corrosion and erosion.

Weather and corrosion resistance are important . . . in the chemical industry and in other industries as well. Important, too, are other Type E features, such as dual protection against overspeed, floating movement of governing and trip linkages, centerline support, parts interchangeability between wheel sizes. Outstanding Type E design assures safe, trouble-free, economical per-

formance for long periods of continuous operation . . . or instant operation when used as a stand-by drive.


Other types in the complete Westinghouse general-purpose turbine line include heavy-duty and multistage units.

Get the facts from your nearby Westinghouse office, or write for twenty-page book B-3896. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-50542

YOU CAN BE SURE...IF IT'S

# Westinghouse

## TYPE E Turbines





# It's good business to plan with Eagle-Picher Insulations...

**Eagle-Picher Insulations offer  
more heat-conserving efficiency per dollar**

*Eagle-Picher Industrial Insulations are the natural choice of smart-thinking purchasing agents, plant engineers and other executives who are concerned with production efficiency and economy. They rely on Eagle-Picher Insulations to cut costs . . . to provide equipment with the highest possible thermal efficiency . . . to help guarantee precise temperature control.*





## Eagle-Picher Insulations are top-flight performers every time!

### 1 You save time, power and money with this hard-working team\* of outstanding insulations:

*Insulating Felts • Supertemp Blocks • Blankets • Loose Wool • Pipe Covering • Stalastic • Insulating Cements • Fireproofing Cement • Diatomaceous Earth Block.*

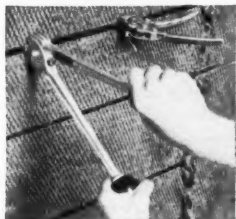
### 2 Eagle-Picher authorized contractor-distributors are skilled thermal engineering specialists.

*They can help you control temperatures accurately and efficiently. They know how to help you solve difficult insulation problems.*

### 3 Eagle-Picher insulations are available where and when you need them.

*Fast delivery is assured by authorized distributors strategically located from coast to coast.*

.....\*A typical team of hard-working materials .....



**Eagle-Picher Mineral Wool Blankets**—The answer to the problem of efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured with flexible metal fabric. Outstanding physical and chemical stability for maximum resistance to water, steam, corrosive fumes and normal vibration.



**Eagle-Picher Super "66" Insulating Cement**—An all-purpose, rust-inhibitive, extra-adhesive insulating cement. Provides great coverage... retains thermal efficiency. Dry coverage, 50-55 sq. ft. 1 inch thick per 100 lbs. Efficient up to 1800 F. Reclaimable where temperatures do not exceed 1200 F. Easily applied on all kinds of surfaces.



**Eagle-Picher Insulseal**—Protects insulation with a tough, weatherproof coating. For temperatures up to 450 F. Smooth troweling qualities assure uniform coverage, proper thickness. Protects against air infiltration, fumes, rain, snow and vibration... withstands severe all-weather service. Dries to a smooth rich black. Washable.

## THE EAGLE-PICHER COMPANY

*Since 1843 • General offices: Cincinnati (1), Ohio*

*Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.*

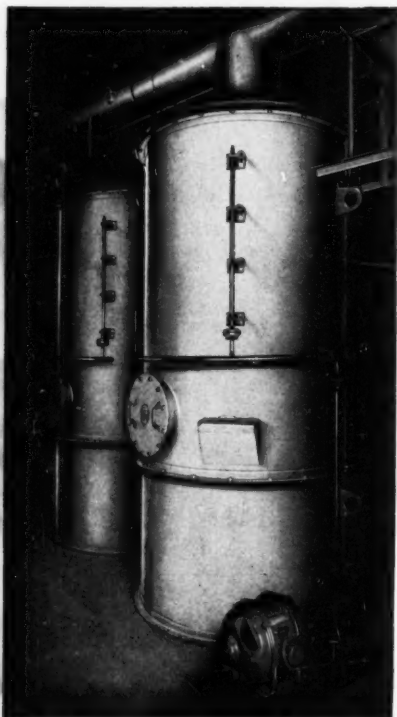
# DUST

and

# FUME

# Control

*Special equipment engineered to solve individual problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, and other troublesome air pollutants*



**MAHON FOG-FILTERS AT WORK**

The installation illustrated above was specially designed for the Motor State Oil & Grease Co., Jackson, Mich. **PROBLEM:** To eliminate H<sub>2</sub>S odor from sulfonated grease manufacturing operation. The problem was complicated by grease and oil fumes present in H<sub>2</sub>S gas. **SOLUTION:** A two-tower Fog-Filter connected in series was designed with high pressure water fog collecting practically all of the grease and oil fumes in the first tower. A caustic solution employed in the second tower and fogged at lower pressure removes the remaining H<sub>2</sub>S from the air before it is exhausted into the atmosphere.

In dealing with air contaminants, each individual air cleaning problem must be approached with a view to determining what type of collector or filter is required to produce maximum results under existing conditions. Study and analysis of the character and extent of the pollutant is therefore imperative in arriving at a satisfactory solution. Mahon dust and fume control engineers have, over a period of years, developed and perfected special Wet and Dry Collectors and Fog-Filters which have proved highly successful in coping with all types of industrial air contaminants—a few are illustrated here . . . they are serving today in some of the most difficult and mandatory air cleaning jobs in industry. Each installation has been engineered to do the specific job. If you have an air pollution problem, regardless of its character, it will pay you to call in a Mahon engineer and let him show you what Mahon equipment has done with like pollutants under conditions comparable to your own. See Mahon's Insert in Sweet's Mechanical Industries File for further information, or write for Industrial Equipment Catalog A-652.

## THE R. C. MAHON COMPANY

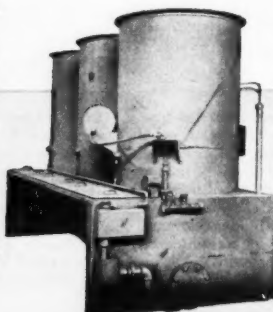
Main Plant and Home Office, Detroit 34, Michigan

Engineers and Manufacturers of Dust and Fume Control Equipment Including Cyclone Collectors, Hydro-Foam Collectors, Jet Trap Collectors, Hydro-Filter Collectors, and Fog-Filters and Cupola Stack Washers.

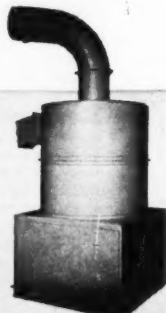
*All Mahon Equipment is Erected by Mahon to Insure Complete Satisfaction.*



Fog-Filter



Hydro-Foam Dust Collector



Jet Trap Dust Collector

# MAHON

# EXPANSION-CONTRACTION-VIBRATION...

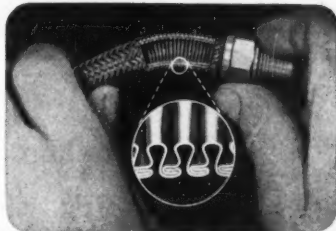
## Here are 3 Ways to Cure Them!

These are the right connections—wherever there's unwanted motion—  
—or critical temperature, pressure, vacuum or corrosive action.



**TITFLEX®**  
All-Metal  
Flexible Hose

stands up to conditions that would ruin rigid tubing. You can use it for scores of ticklish jobs... Connect misaligned or moving parts of machinery. Absorb vibration, or pulsation. Transmit vacuums, shield wires and cables against electrical or electronic interference. Handle difficult gases, vapors or liquids—from ammonia to acid to sea-water to steam. There's more than one application in your plant *right now* that needs TITFLEX.

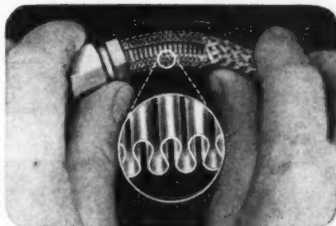


Sectional view shows rugged, flexible, seamed construction of TITFLEX.

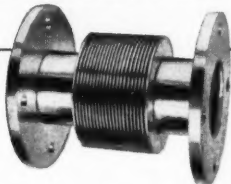


**UNIFLEX**  
Helically-Corrugated  
Seamless Flexible Tube

is tough, corrosion-resistant, leakproof. Use it in applications too tough for ordinary concentric tubing. For example, oil burners, hydraulic lines, air conditioning equipment, refrigeration machinery, pumps, compressors, diesels and machine tools. Metal-to-metal seat of UNIFLEX fittings assures leakless service. Helical, seamless wall structure gives it greater flexibility and longer life. Thoroughly tested in service, UNIFLEX offers real advantages where conventional tubing gives trouble.

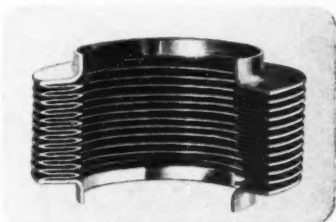


Note the helically-corrugated, seamless wall structure of Uniflex.



### TITFLEX BELLOWS

have unique, welded, convoluted-diaphragm construction. They absorb lineal movement in many types of equipment—*without* weakening lines and without reducing the flow rates of gases or liquids being conveyed. Use TITFLEX Bellows to accommodate lineal contraction and expansion or high frequency vibration, to seal high pressure valves and shafts, or to handle gases and corrosive liquids at high temperatures. For special applications, special designs can be furnished. Complete bellows assemblies can be supplied with any required types of fittings.



Cross-section shows the welded, convoluted-diaphragm construction of TITFLEX Bellows.



**FOR FREE LITERATURE** check the products (below) that interest you and mail the coupon. By return mail we'll send you current TITFLEX literature, containing full descriptions, technical data and suggestions for use. Also, if you have a specific problem, our Engineering Staff will be glad to discuss it with you without obligation.

## Let Our Family of Products Help Yours

**Titeflex**

✓ Check products you are interested in.



☐ SEAMED AND SEAMLESS METAL HOSE



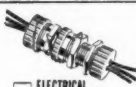
☐ PRECISION BELLOWS



☐ IGNITION HARNESS



☐ IGNITION SHIELDING



☐ ELECTRICAL CONNECTORS



☐ RIGID AND FLEXIBLE WAVE GUIDES



☐ FILTERS



☐ FUSES

TITFLEX, INC.  
504 Frelinghuysen Ave.  
Newark 5, N.J.

Please send me without cost information about the products checked at the left.

NAME \_\_\_\_\_  
TITLE \_\_\_\_\_  
FIRM \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



# AMERICAN BLOWER

## centrifugal



**Motor**—Standard NEMA construction. Short motor shaft extension and conservative impeller loads assure operation below first critical speed of rotor assembly. **Baseplate**—heavy welded steel for rigidity and accurate alignment.

**Shaft Packing**—Nonferrous, cast construction. No mechanical contact between stationary and rotating parts. **Backplate**—cast iron, bolts with dowel fit to baseplate.

**Spacer Disc**

**Impeller**—Shrouded, single-piece, heat-treated, cast-aluminum alloy construction. Statically and dynamically balanced. Over-speeded to 20% above maximum operating speed before assembly.

**Shaft Nut**

**Volute Casing**—Cast-iron construction. Bolts with dowel fit to backplate. Twenty-four casing positions available in either direction of rotation.

*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER

# compressors

*Designed for*  
**EFFICIENCY**

*Built for*  
**DEPENDABILITY**

American Blower Single Stage Centrifugal Compressors offer several outstanding design features.

For example, the improved scroll design and deep diffuser passage efficiently convert velocity energy into pressure. Labyrinth annulus packing minimizes recirculation of gas around impeller inlet. Aerodynamic design of impeller blade inlets results in high efficiencies and dependable performance.

Before shipment, each compressor is thoroughly tested in accordance with A.S.M.E. Power Test Code for Centrifugal Compressors and Exhausters.

American Blower single stage units are available in sizes from 30 to 600 HP with pressures from  $1\frac{1}{4}$  to  $3\frac{3}{4}$  lbs. For technical data consult the nearest American Blower Branch Office or write us for Bulletin 109.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN  
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN RADIATOR & Standard Sanitary Corporation

**AMERICAN  BLOWER**

**Suction Cover**—Cast-iron suction cover forms outer wall of diffuser passage and bolts with dowel fit to volute casing.

**Annulus Packing**—Permits accurate alignment with impeller during assembly. **Inlet Nozzle**—Provides uniform gas distribution. Flanged for standard pipe connections.

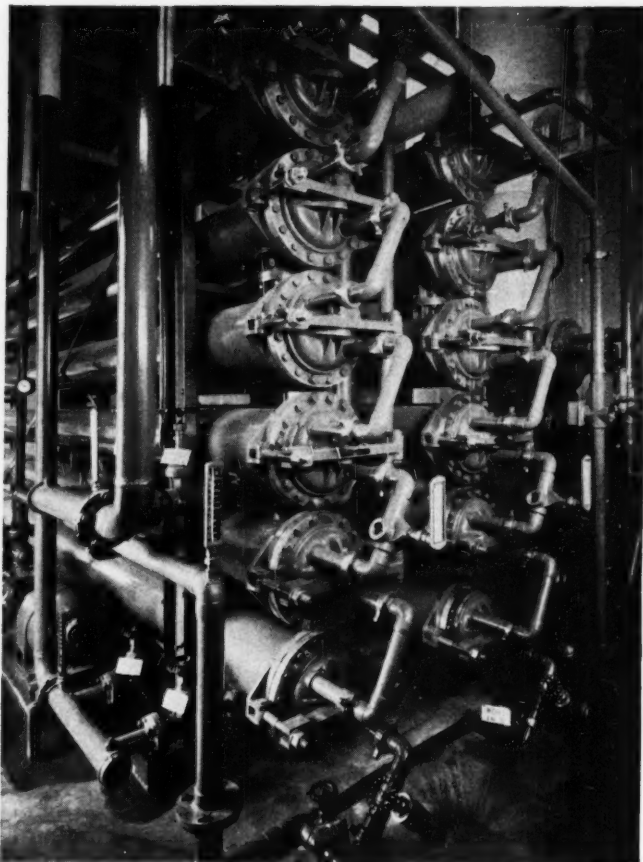
CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON  
CHEMICAL ENGINEERING—November 1952



have a beer?



**This Hot Wort Cooler  
Handles 130 GPM →**



**HOT WORT** is beer as it comes from the kettle, before fermentation. In this cooler in the Blitz-Weinhard Brewery wort is rapidly brought down from 200° to 45°.

—and economical Anaconda Copper—traditional brewer's metal  
—makes it highly efficient and insures long life

There was good reason to choose ANACONDA Copper for this heat exchanger made by Enzinger Union Corporation, Angola, N. Y., for the Blitz-Weinhard Brewery, Portland, Oregon. Copper is friendly to beer and will not corrode; it costs less, yet cools faster because it has a higher heat transfer rate than other metals. In this cooler not only the inner tubes, but also the outer shells are made from hard-drawn copper. The inner tube surfaces of copper may be economically cleaned by forcing brush-balls under pressure

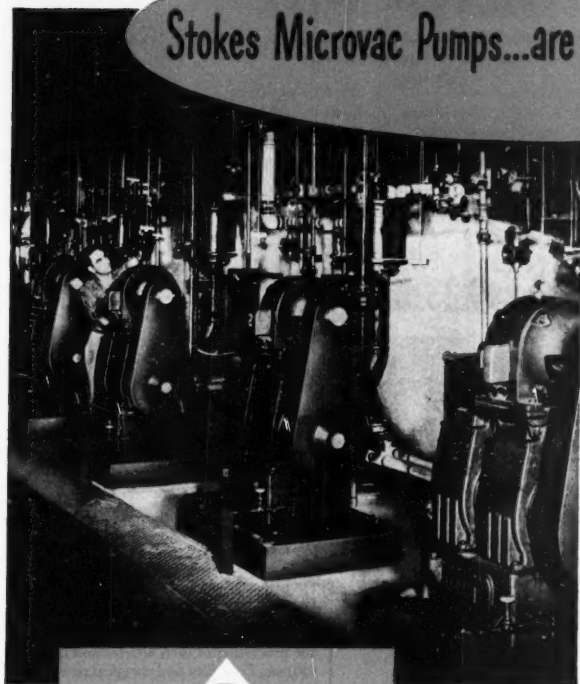
through the inner tubes, which are connected in series.

In chemical processing, selection of the right metal and the right alloy determines economy of operation and length of service life. For no one metal or alloy is best for *all* conditions. If you have a specific application in mind, consult our Technical Department. Their experience in brass and copper is over a century old... and is at your disposal. Write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

62188

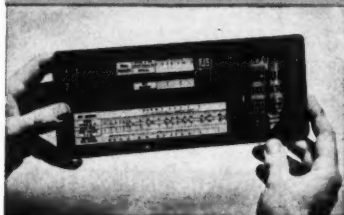
for efficient heat transfer **ANACONDA®** heat exchanger tubes

## Stokes Microvac Pumps...are basic to Vacuum Processing



Typical installation of Stokes Vacuum Pumps.

Send for new Vacuum Calculator for rapid slide-rule calculations. Includes standard ABCD log scale. Also send for Catalog 700, "Stokes Microvac Pumps for High Vacuum" with copious reference material.



High volumetric and mechanical efficiency make these famous pumps economical and reliable units in any vacuum system.

Capacities of Stokes Microvac Pumps run from 15 to 500 cfm... pressures to 10 microns absolute. Power consumption is low and the top-mounted motor contributes to compact design requiring minimum floor space.

Lubrication of the four moving parts (including the exhaust valve of corrosion-resistant Teflon) is fully automatic. There are no stuffing-boxes or grease-fittings, and no packing.

Parts are precision-finished, standard and interchangeable. Freedom from wear assures years of trouble-proof service.

Stokes is the only manufacturer of equipment for complete vacuum systems, including Microvac mechanical pumps, oil diffusion pumps, McLeod Gages and Vacuum Valves.

Consult with Stokes on the application of vacuum to drying, freeze-drying, impregnating, extraction, solvent recovery, evaporating, vacuum metallizing, and to other purposes for which vacuum deserves exploration.

### STOKES MAKES

Plastics Molding Presses,  
Industrial Tabletting  
and Powder Metal Presses,  
Pharmaceutical Equipment,  
Vacuum Processing Equipment,  
High Vacuum Pumps and Gages,  
Special Machinery

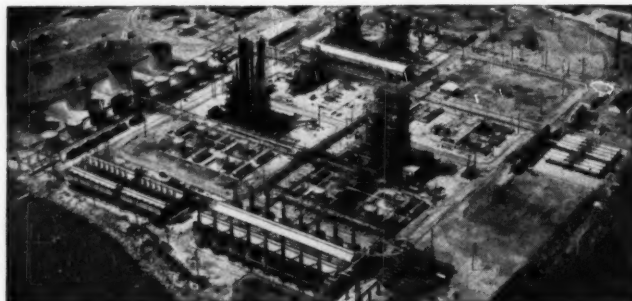
# STOKES

F. J. STOKES MACHINE COMPANY, 5520 Tabor Road, Philadelphia 20, PA.

# MONSANTO

CHEMICALS — PLASTICS

## Ethylbenzene Available from Texas City



**1** From this modern plant comes Monsanto ethylbenzene in tank car, truckload and drum-size quantities. Increased capacity now makes this low-cost, reactable compound available for large-scale chemical processing.

As a solvent, Monsanto ethylbenzene is supplied at minimum 99% purity. Boiling point is in the xylene range: 136°C. (227°F.).

As a gasoline blender, Monsanto ethylbenzene increases aromatic content, raises octane number.

As the starting point Monsanto ethylbenzene aids in production of chlorostyrenes, intermediates, dyestuffs, pharmaceuticals. Here are just a few of the organic compounds that can be derived practically from Monsanto ethylbenzene.

5-*m*-Dioxanyl phenyl ketone  
*alpha*, *alpha*'-Bis (chloromethyl) acetophenone

2-Benzoyl-1, 3-propanediol diacetate  
Acetophenone

*alpha*-Chloroacetophenone  
*alpha*, *alpha*'-Dimethylhydrobenzoin  
*alpha*-Methylbenzyl alcohol

*o*-Chlorobenzoic acid

*p*-Chlorobenzoic acid

*o*-Aminobenzoic acid

*p*-Aminobenzoic acid

1-Chloro-2-ethylbenzene

1-Chloro-4-ethylbenzene

1-Chloro-4(2)-(1-chloroethyl) benzene

*p*-Chloroacetophenone

*p*-Chloro-*alpha*-methylbenzyl alcohol

*o*(*p*)-Chlorostyrene

*p*-Chlorostyrene

8-Ethylquinoline

6-Ethylquinoline

*p*-Nitrostyrene

*o*-Ethylaniline

*p*-Ethylaniline

*alpha*-Methyl-*p*-nitrobenzyl alcohol

*o*-Ethylnitrobenzene

*p*-Ethylnitrobenzene

*o*-Nitroacetophenone

*p*-Nitroacetophenone

*o*-Nitrobenzoic acid

*p*-Nitrobenzoic acid

*o*-Aminoacetophenone

*o*-Amino-*alpha*-methylbenzyl alcohol

*p*-Ethylacetophenone

*p*-Ethylbenzoic acid

Methyl *p*-ethylbenzoate

Methyl *p*-acetylbenzoate

Methyl *p*-(1-hydroxyethyl) benzoate

Methyl *p*-vinylbenzoate

*p*-Ethylphenyl thiolacetate

*p*-Ethylbenzenesulfonyl chloride

*p*-Ethylbenzenethiol

*p*-Ethylbenzenesulfonic acid

*p*-Ethylphenol

*p*-Ethylphenyl acetate

*p*-Acetylphenyl acetate

*p*-(1-Hydroxyethyl)phenyl acetate

*p*-Vinylphenyl acetate

Ethyl *p*-ethylbenzyl ether

*p*-Ethylbenzyl chloride

*p*-Ethylbenzyl acetate

*p*-Acetylbenzyl acetate

*p*-(1-Hydroxyethyl)benzyl acetate

*alpha*'-Methyl-*alpha*'-, *alpha*'-*p*-xylenediol diacetate

*p*-Vinylbenzyl acetate

*p*-Vinylbenzyl alcohol

## Nontoxic Plasticizers Important in Medical And Surgical Fields

**2** When blood or blood plasma is being administered to a patient, it flows through a small, unimportant-looking piece of tubing. However, army medics rightly call that tubing the "life line." It must meet the severest kind of requirements . . . be completely nontoxic as well as absolutely sterile.

In the production of such tubing, Monsanto plasticizers play a vital part. Santicizers\* B-16, E-15 and 141 make possible the processing of such articles and impart softness, flexibility and chemical resistance.

Other important applications of nontoxic plasticizers in surgery include their use in the formulation of vinyl chloride for sponge material required in lung-collapsing operations.

These plasticizers are also used in the manufacture of hospital sheeting, prosthetic devices, gum dentures and similar products. Perhaps the special characteristics of Monsanto plasticizers can help you. Why not use the coupon for more information?

## Monsanto Penta Available In New Dustless Form

**3** A new dustless form of pentachlorophenol, just announced by Monsanto, makes this widely-used wood preservative easier to handle. In addition, it dissolves more rapidly in petroleum oils. The regular dry-crystal form of Monsanto Penta still is available for those who prefer it.

The new Monsanto Penta has the same excellent wood-preserving qualities as the dry crystals. It will add years of life to wood by repelling termites and preventing decay. It can be formulated so that treated wood remains clean and paintable.

For information on the use of Monsanto Penta, contact the nearest Monsanto Sales Office or mail the coupon.

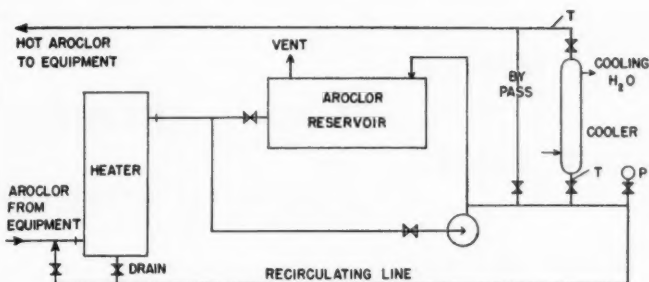
**4** In the plastics field HB-40 can be used with polystyrene, vinyl resins, ethylcellulose and asphaltic compounds. It also acts as a "softener" or swelling agent for rubber-type compounds.

HB-40 has proved excellent for use in casting resins, vinyl plastisols, vinyl calendered film, profile extrusions and wire coatings. For complete information send in the coupon and receive your copy of our Technical Bulletin No. P-104.

**5** The answer to the headline is "yes" if you are in the rubber manufacturing business. This compound, called Santoflex® AW, is an effective means of reducing the attack of ozone on rubber.

Santoflex AW reduces the attack of ozone and is particularly effective under dynamic conditions.

Santoflex AW, however, is only one of a wide line of rubber chemicals produced by Monsanto. Others include various types of accelerators and numerous special products. For complete information, use the coupon.



## Aroclor 1248 as Heat-Transfer Medium Demonstrates Excellent Characteristics

Outstanding performance characteristics of Aroclor 1248 were recently demonstrated when it was used in a unit designed for pilot operations to reach temperatures not attained by ordinary steam pressures. The basic factors of the design are as follows:

1. Operating temperature 300°C. maximum.
2. Capacity: approximately 40,000 B.t.u. per hour based on vaporizing about 200 pounds per hour of organic material having a heat vaporization of 150 B.t.u. per pound. Heat loss allowance: 30%.

A portable electric heater was devised using Aroclor as the heat-transfer medium. Aroclor, consisting of chlorinated biphenyl and polyphenyls, has several advantages. Extensive testing has shown it capable of meeting these requirements:

Freedom from fire hazard.

Viscosities sufficient to permit pumping at room temperatures.

Boiling point sufficiently above 300°C.  
to assure liquid condition at all  
times.

Stability against heat, plus enough safety factor to accommodate accidental overheating.

#### Controllable vaporization losses.

Freedom from corrosive action against valves, piping, tank, jackets, made of cast iron and steels, bronze and stainless steel.

Freedom from toxicity hazard in properly enclosed system.

With a heat-transfer medium that could meet all these requirements—Aroclor 1248—a unit was built with the following elements (see flow diagram): A reservoir for the chlorinated Aroclor; a circulating pump and electric oil-immersion heater; a water-jacketed cooler; instrumentation to provide control of circulating fluid temperature; and pipelines from heating unit to and from equipment to be heated.

**MONSANTO CHEMICAL COMPANY**, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

\*Reg. U. S. Pat. Off.



**SERVING INDUSTRY...WHICH SERVES MANKIND**

☐ Plasticizers  
☐ Penta

Technical Bulletins ☐ No. P-104, "HB-40";  
☐ No. P-130, "An Indirect Aroclor Heater for  
Unit Chemical Operations." ☐ Booklet,  
"Monsanto Chemicals for the Rubber Industry."  
☐ Technical Data Report, TX12, subject:  
ethylbenzene.

## 1700 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information or literature as indicated at left.

Name.....Title.....

Company.....

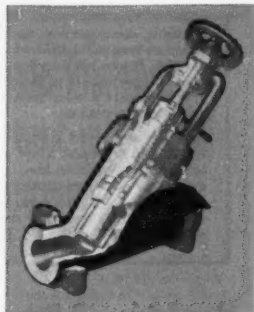
Street.....

City ..... Zone ..... State .....

**Y VALVES**  
**ANGLE VALVES**  
**SAFETY VALVES**  
**PLUG COCKS**  
**PIPE and FITTINGS**

**OF SOLID CHEMICAL PORCELAIN**  
**ARMORED WITH FIBERGLASS-**  
**REINFORCED PLASTIC**

# Lapp TUFCLAD



**Lapp**

**PROCESS EQUIPMENT**

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS  
 PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

For problems involving severe corrosion or freedom from metallic contamination, the chemical processing industry has found no more effective—or economical—material than Lapp Chemical Porcelain. Now this same solid porcelain material is available with TUFCLAD, a new *tough* armor which greatly adds to operating security—protection of personnel and equipment—certainty of avoiding product loss.

TUFCLAD is woven Fiberglass fabric, impregnated and bonded in multiple layers to the porcelain body with an Epoxide resin of high strength and chemical and heat resistance. Armor is tightly knit to porcelain and runs end-to-end, under flanges.

In operation, TUFCLAD provides a cushion to protect porcelain against accidental damage in handling or operation—and an insulator against thermal shock. But most important, the TUFCLAD shell is of itself homogeneous and *tough*—fully able to hold operating pressures against gross leakage even though porcelain is damaged by accident, explosion or fire.

Write for description and specifications of Lapp TUFCLAD-armored Porcelain valves, plug cocks, safety valves, flush valves, pipe, fittings and special shapes. Lapp Insulator Co., Inc., Process Equipment Division, 514 Maple Street, Le Roy, N. Y.





## Are Your Profits Going Up In Smoke?

**Let Bailey Controls Help Cut Down Your Production Losses**

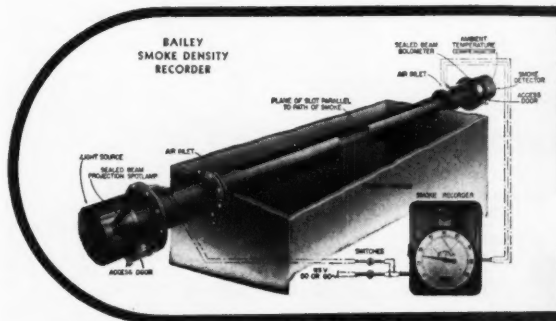
Process materials or fuels that go up the stack as dust or products of incomplete combustion are the same as money thrown to the four winds. But unlike money, this air pollution is not welcome in your community.

Your local Bailey Engineer can help you reduce this waste—and improve your relations with smoke prevention officials. The solution he offers will be based on many years of Company experience in the burning of commercial and waste fuels. He has information which will help you to arrive at the best control set-up for fuels, fired singly or in combination in a wide variety of furnaces, heaters, kilns, ovens and dryers.

His selection of meters and controls for your needs is based on a *complete* line of equipment. He can offer you Fuel—Air Ratio Meters or Gas Analyzers; Pneumatic or Electric Telemetering; Orifices, Flow Nozzles, Venturis or Weirs; full size or miniature instruments—and an infinite selection of automatic control systems from which to choose the one best suited to the operation of your process.

Bailey Engineers are located in almost every large industrial center. A call to our nearest office is a good first step in the solution of your fuel economy and smoke prevention problems.

P-25



**BAILEY  
METER  
COMPANY**

**1054 IVANHOE ROAD  
CLEVELAND 10, OHIO**

*Process  
Controls*

TEMPERATURE · FLOW  
PRESSURE · LEVEL  
GAS ANALYSIS · RATIO

# Taylor announces

1. Dry meter operates on force-balance principle. Diaphragm of Teflon coated glass cloth. Body working pressure rating 1500 psi. Available in either forged steel or type 430 stainless steel.

2. Vent screws to provide for total filling in liquid service.

8. Provision for adjustment of range suppression up to 100%.

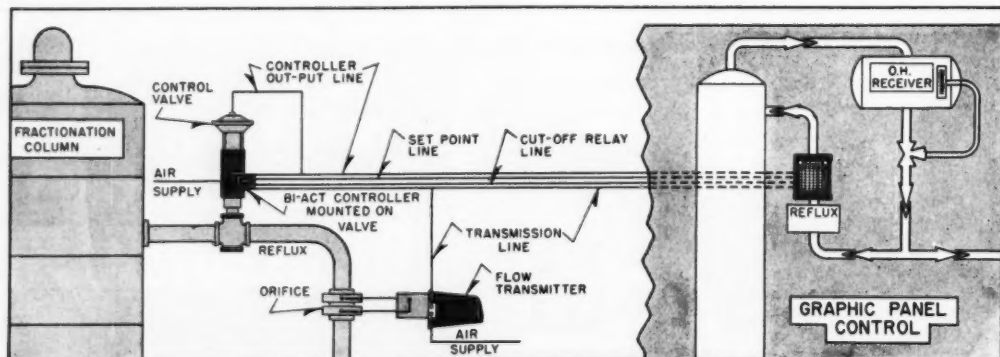
7. Built-in, trouble-free, capillary type hydraulic damping provides stability of pneumatic circuit. No filling,—no mess—no dashpot.

3. Pressure taps mounted in vertical plane. Two high side and two low side taps provide self venting or self-draining. This feature simplifies installation and maintenance.

4. Standard angle bracket permits side, top or bottom mounting. Pipe stand mounting (also for side, top or bottom) available.

5. Range change easily and quickly made. Sliding pivot is roughly positioned to within plus or minus 4% of desired range (printed on beam) and locked. Fine trim adjustment by means of screw driver.

6. Relay valve speeds differential pressure changes to controller or receiver, providing excellent linearity and minimum hysteresis.



# SIMPLIFIED FLOW MEASUREMENT

*With the NEW Taylor TRANSAIRE®  
Differential Pressure Transmitter*

## INEXPENSIVE AND SIMPLE TO INSTALL

1. Simplified piping because it can be close coupled to orifice flanges.
2. No leveling—mercuryless dry meter.
3. Side, top or bottom bracket mounting; available with 2" pipe stand.
4. No seal pots required—negligible displacement because of force balance construction.
5. Light weight for easy handling; weighs only 23 lbs.
6. Vent screws for simple, solid filling.

## ECONOMICAL—EASY TO MAINTAIN

7. Self draining or venting—no periodic manual venting or draining.
8. Mercuryless — flexible but tough Teflon coated glass fabric diaphragm.
9. Overrange protection to full body rating.
10. Purges, if required, can be installed to keep body swept clean.
11. Simple range change by sliding pivot—screw driver trim.

## ACCURATE

12. Relay valve for linearity, minimum hysteresis, fast speed of response.
13. Pressure effect 0.2% / 100 psi. change.
14. Temperature effect 1.0% / 100°F. change.
15. Self draining and venting. No errors build up during operation.
16. Damped pneumatic circuit—stable air output even on vibrating pipe lines.

## RUGGED AND DEPENDABLE

17. Body forged steel or type 430 Stainless Steel. Working pressure rating, 1500 psi.
18. Weather proof housing built for tough service and outdoor mounting.
19. Force balance construction—negligible motion—minimum possible wear.
20. Process sealing bellows 3-ply type 316 stainless steel.

## ADAPTABLE

21. 100% suppression—continuously adjustable from 0 to 100%. Ideal for liquid level applications.
22. Ten-to-one rangeability in each of two forms: a. 20-200" water b. 80-800" water.

**Find out more** about this new flow and liquid level transmitter. Ask your Taylor Field Engineer, or write for **Bulletin 98226**. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.*

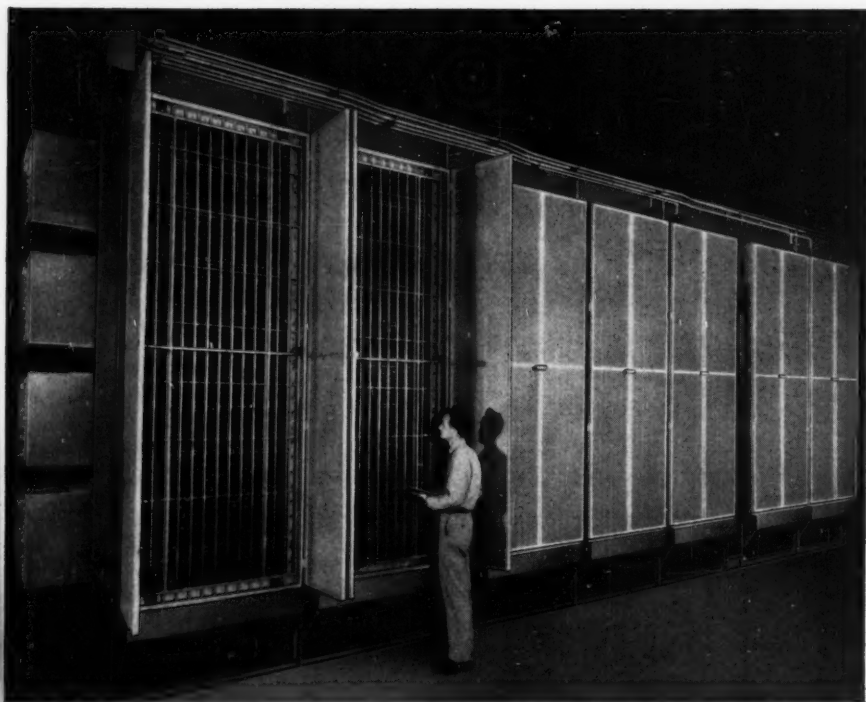
*Taylor Instruments*

— MEAN —

**ACCURACY FIRST**

IN HOME AND INDUSTRY

# a single source for all air cleaning equipment



\* AAF's **ELECTRO-MATIC**—Introduced by American Air Filter in 1939, the automatic self-cleaning **ELECTRO-MATIC** incorporates the most advanced application of the electronic principle of air cleaning. Automatic operation

assures constant, uniform performance—a vital factor in air conditioning and many critical industrial processes. American Air Filter manufactures four other electronic precipitators which utilize every known method of maintenance.

## Why five types of electronic\* air cleaners?

AAF's five types of electronic precipitators have highly individual characteristics . . . for a reason! They were developed to meet complex and distinctly different air cleaning requirements for fine particle size in commercial, industrial and domestic applications. These five types offer the engineer

maximum flexibility in combining the following factors to fit specific job requirements:

- Efficiency Ratios
- Maintenance Methods
- Space Requirements
- Sizes and Air Volumes
- Practical and Realistic Range of Costs

In addition to a complete line of air cleaning equipment, AAF offers a nationwide engineering service, which is outstanding in this field. On all air cleaning problems call your AAF representative for expert advice, or write direct to us for engineering data and bulletins.

# American Air Filter

COMPANY, INC.

326 Central Avenue, Louisville 9, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California



# What one tube steel gives you the best life/cost ratio? Ask the experts!

This month the Timken Company reports on:

## 18-8 STAINLESS

An austenitic, non-magnetic alloy that shows the best combination of creep strength, oil corrosion resistance and oxidation resistance for service up to 1500° F. For use in oil cracking systems, hydrogenation equipment, high temperature oil and steam piping, superheater elements, heat exchangers.

### ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

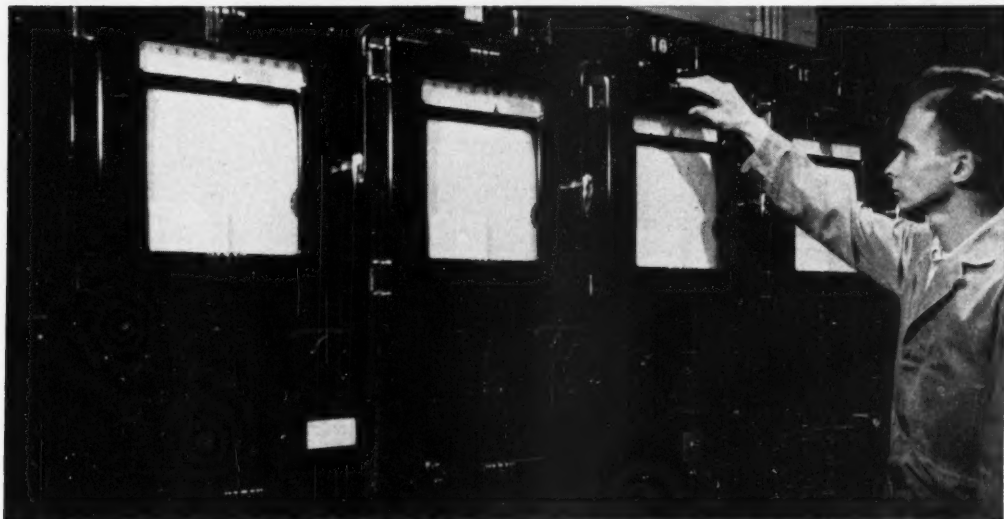
\*Available as seamless tubing on an experimental basis only.

\*\*Not available as seamless tubing.

YOU probably can find several high temperature steels that are adaptable to your particular heat, pressure, oxidation and corrosion conditions. But there's only one steel that will give you maximum tube life per dollar—the best life/cost ratio.

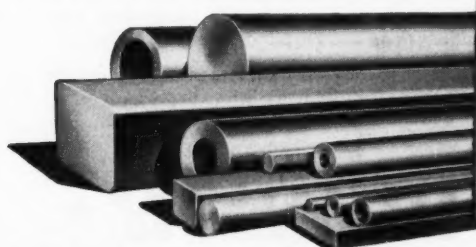
To get the one tube steel that's best for you, whether it's one of 8 analyses of stainless or one of 16 other analyses, call on the Timken Company's metallurgists. They're recognized authorities on high temperature steels. With 25 years' experience in steel development and with 24 different analyses to choose from, they can help you select the one steel that gives you the most for your tube dollar.

The Timken Company is one of the oldest producers of stainless and other high temperature steels in the country. Let our "RSQ"—Research, Supply, Quality—solve your tube problems. Ask the experts! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



One reason for the Timken Company's leadership in high temperature steels is never-ending research. Photo shows the instruments which control the furnaces used in determining proper heat treatment for high temperature steels.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



**TIMKEN**  
TRADE-MARK REG. U.S. PAT. OFF.  
*Fine Alloy*  
**STEEL**

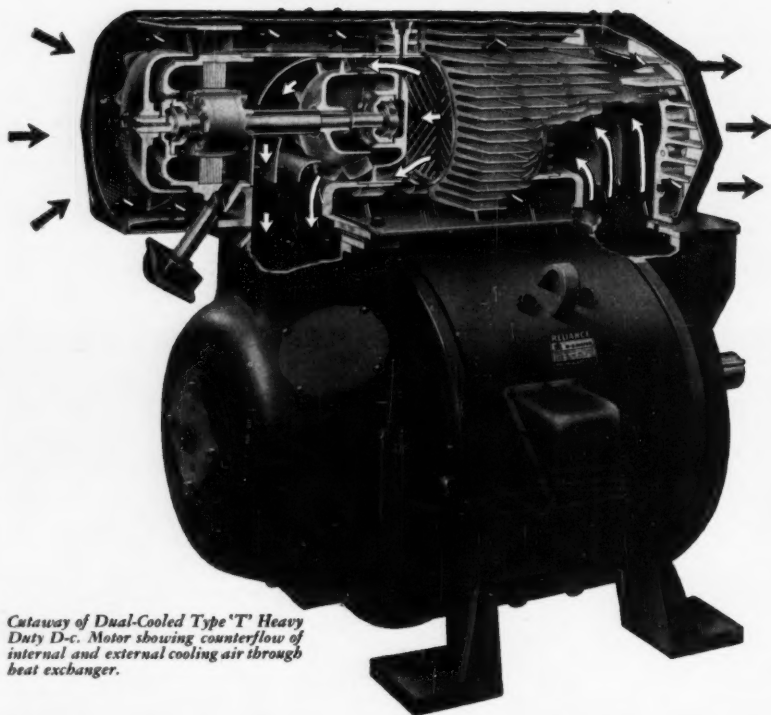
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

CHEMICAL ENGINEERING—November 1952



# RELIANCE *Totally-Enclosed* *Dual-Cooled* D-C. MOTORS

PATENT APPLIED FOR



*Cutaway of Dual-Cooled Type 'T' Heavy Duty D-c. Motor showing counterflow of internal and external cooling air through heat exchanger.*

## for Wider Speed Ranges...Higher Ratings

New Reliance Dual-Cooled Motors provide dependable totally-enclosed, fan-cooled operation over wider speed ranges and higher ratings than were ever before possible . . . and this is accomplished with floor-space savings of up to 30%!

Dual-Cooled Motors are completely enclosed . . . have two separate cooling systems operating independently of the motor speed. One system circulates high-velocity air within the motor, that is cooled in the finned inner duct of the heat exchanger. This heat is dissipated in the other system by

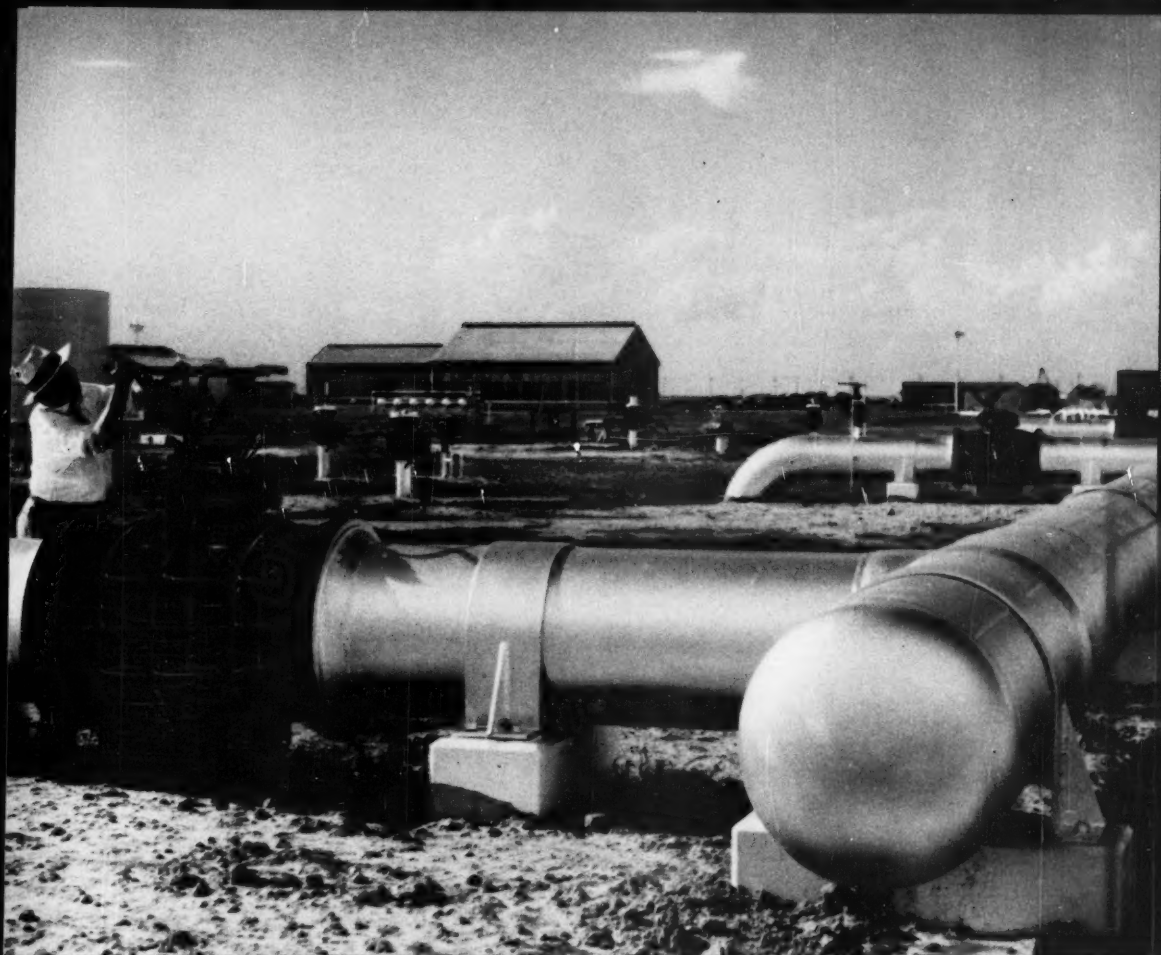
air sweeping through the fins of the outer duct.

The Dual-Cooled Motor is especially adaptable to Reliance adjustable-voltage V\*S Drive and is available in ratings from 15 through 150 horsepower. Explosion-proof Dual-Cooled Motors are available through 100 hp., in conformity with Underwriters and Bureau of Mines specifications.

Whatever your application . . . get further details from the nearest Reliance Sales Office . . . or write for Bulletin C-2201.

# RELIANCE **ELECTRIC AND ENGINEERING CO.**

1042 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities



**WHEN YOU  
Standardize on Nordstrom Valves  
You Standardize on Dependability**

Whatever the service, whatever the size of the line, write Nordstrom valves into your standards. That way, you can make your first valve installation in any spot a permanent one.

**Rockwell Built**

Another

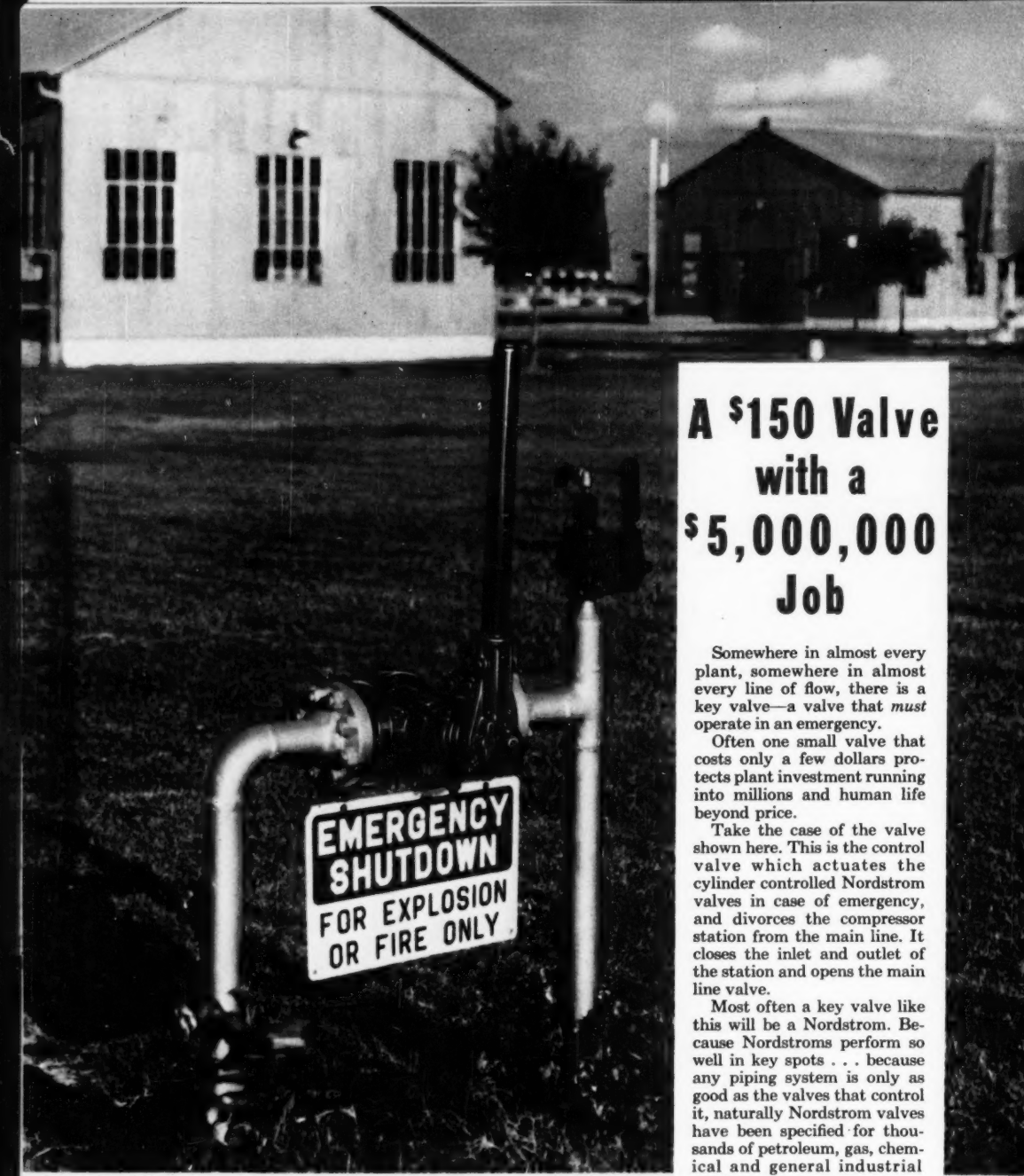


Product



**Nordstrom Valves**

LUBRICANT SEALED TO KEEP UPKEEP DOWN



## A \$150 Valve with a \$5,000,000 Job

Somewhere in almost every plant, somewhere in almost every line of flow, there is a key valve—a valve that *must* operate in an emergency.

Often one small valve that costs only a few dollars protects plant investment running into millions and human life beyond price.

Take the case of the valve shown here. This is the control valve which actuates the cylinder controlled Nordstrom valves in case of emergency, and divorces the compressor station from the main line. It closes the inlet and outlet of the station and opens the main line valve.

Most often a key valve like this will be a Nordstrom. Because Nordstroms perform so well in key spots . . . because any piping system is only as good as the valves that control it, naturally Nordstrom valves have been specified for thousands of petroleum, gas, chemical and general industrial services.

The Nordstrom record of dependability and low cost is the best recommendation you could ask. Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 8, Pa.

**Rockwell Built**  
Another  Product **Nordstrom Valves**

LUBRICANT SEALED TO KEEP UPKEEP DOWN



# LADISH

*Controlled Quality*

## PIPE FITTINGS

**maximum service  
assured  
by metallurgical  
soundness**

Sound metallurgy . . . the result of unsurpassed facilities and advanced laboratory controls . . . provides the maximum of dependability in Ladish Controlled Quality fittings. Every phase of metal quality . . . composition, structure and physical properties . . . is continuously safeguarded—and certified proof of metallurgical integrity is available to users of Ladish fittings.



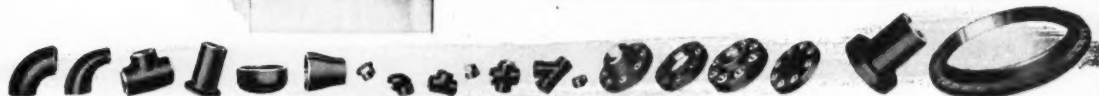
TO MARK PROGRESS


THE COMPLETE *Controlled Quality* FITTINGS LINE  
PRODUCED UNDER ONE ROOF . . . ONE RESPONSIBILITY

### LADISH CO.

CUDAHY, WISCONSIN  
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul  
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.





Will your  
**PROCESS PIPING**  
be old before  
its time?



**NOT** if you use Chase Copper Water Tube. Many industrial process lines of copper installed years ago are still bright and clean inside.

Chase Copper Water Tube is corrosion-resistant . . . can't choke up with rust. Industrial fluids continue to flow easily because the effective cross-section is maintained.

And, Chase Copper Water Tube cuts repair and replacement costs because it is more durable than rustable pipe.

When installing process lines consider Chase Copper Water Tube and Fittings, solder-joint or flared.

**Chase**  **BRASS & COPPER**

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• The Nation's Headquarters for Brass & Copper

Albany†  
Atlanta  
Baltimore  
Boston  
Chicago  
Cincinnati

Cleveland  
Dallas  
Denver†  
Detroit  
Houston†  
Indianapolis

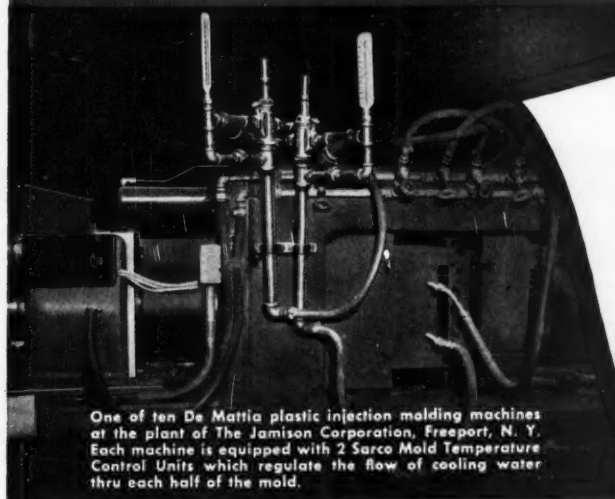
Kansas City, Mo.  
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Philadelphia  
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St. Louis

San Francisco  
Seattle  
Waterbury  
  
(†sales office only)



# THIS SIMPLE Cooling Control



One of ten De Mattia plastic injection molding machines at the plant of The Jamison Corporation, Freeport, N. Y. Each machine is equipped with 2 Sarco Mold Temperature Control Units which regulate the flow of cooling water thru each half of the mold.

If maximum production of quality plastics is to be secured from an injection molding machine, nothing can be left to chance.

Control must extend not only to raw material, timing cycle and injection pressure — it must include also the temperature of the mold.

## SARCO Self-Operated Temperature Regulators

are easily connected to the cooling water system. Constant mold temperature increases production, cuts rejects, and saves water.

Of a similar installation on four machines at Caldwell Products, Inc., New York, Mr. Leaf, Plant Superintendent writes:

*"These Sarco controls have been in operation and are wonderful. Increased efficiency saves at least \$25.00 each day on each molding machine. In addition, the reduction of rejects has saved us raw materials. As further bonus, we save water."*

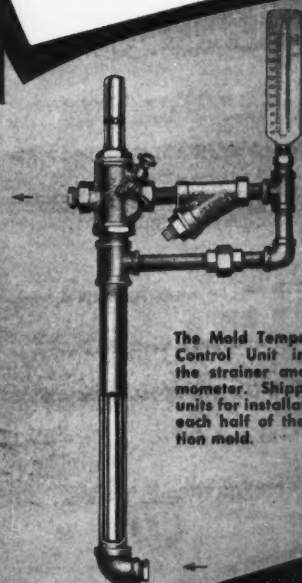
Write today for free copy of Bulletin 704

**SARCO** COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N. Y.

Represented in Principal Cities

SARCO CANADA LTD., TORONTO 8, ONTARIO







The Mold Temperature Control Unit includes the strainer and thermometer. Shipped as units for installation on each half of the injection mold.

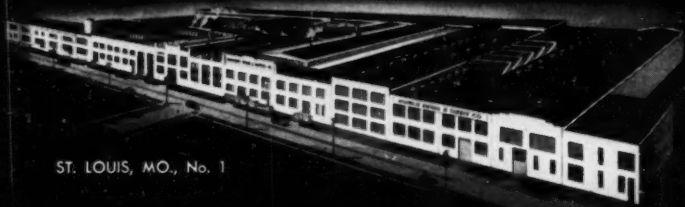
Also used on COOLING SYSTEMS for

AIR COMPRESSORS  
SOLVENT STILLS  
LIQUID FEEDERS  
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DEGREASERS, ETC.

# Users of Piping

whether a simple bend  welded assembly  or  
complete piping systems for power plant  or process 

## Get Multiple Advantages from **MIDWEST** Multiple Plants



ST. LOUIS, MO., No. 1



ST. LOUIS, MO., No. 2



LOS ANGELES, CALIF.



PASSAIC, N. J.



BOSTON, MASS.

Strategically located multiple plants and large scale operations have made it economically practicable for Midwest to develop much special pipe fabricating machinery and to conduct piping research that would be impossible under other circumstances. Multiple plants create a friendly rivalry between the organizations of these plants that advances the art of piping fabrication more rapidly than would otherwise occur. All these activities are reflected in better fabricated piping . . . in greater piping value per dollar. Multiple plants help make Midwest the preferred source for prefabricated piping.

**MIDWEST**

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COMPANY, INC.**

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PIPING FABRICATORS AND CONTRACTORS FOR MORE THAN 50 YEARS

from CLARIFICATION OF PANCREAS EXTRACT  
to PURIFICATION OF BENZENE HEXACHLORIDE  
to RECOVERY OF MEAL FROM FISH LIQUOR  
to REMOVAL OF SALT FROM CONCENTRATED CAUSTIC SODA  
to DEWATERING OF CRUDE LACTOSE

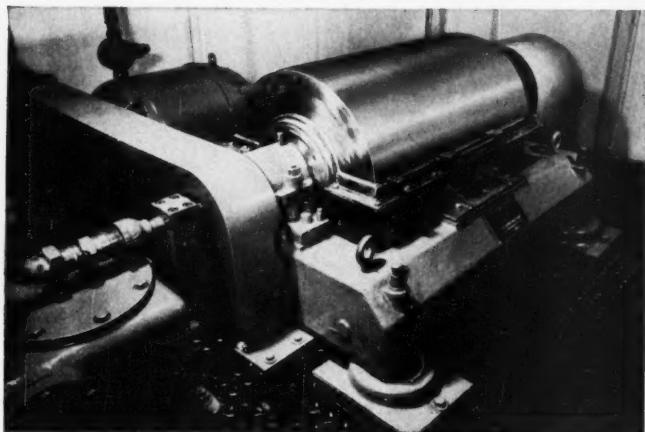
## that's the story of the versatile SHARPLES SUPER-D-CANTER CENTRIFUGE

The Super-D-Canter handles slurries and suspensions of practically any consistency—from 1% solids to relatively thick sludges—with solid particles from  $\frac{1}{2}$  inch in size down to extremely small particles.

Solids are continuously moved through the Super-D-Canter by means of a helical conveyor, while under high centrifugal force (2100 x g). The clarified liquid continuously overflows adjustable weirs.

For solids which pack tightly and have a high angle of repose, a conical rotating bowl is provided; for relatively soft solids with low angle of repose, a cylindrical rotating bowl is available.

The Sharples Super-D-Canter is a production tool of the process industries that pays big dividends. It would pay you to write for a copy of Sharples Bulletin 1254 which gives complete details on the Super-D-Canter.



*The Super-D-Canter in insulin production.*

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# cochrane

## water conditioning

### STARTS WHERE NATURE STOPS

Nature's purest water will not meet the stringent requirements of modern industrial processing. The presence of minerals, salts or gases makes it unsuitable or uneconomical for direct use. Profitable elimination of corrosive or process retarding elements requires specialized experience such as furnished by Cochrane Water Engineers.

Engineering wisdom dictates that it is not so important to know all the answers as to know where to get them. The problems of Ion Exchange, Demineralization, Deaeration, Dealkalization, and others are complex; and there is only one *best* solution to any set of conditions. That's why leading engineers and consultants call on Cochrane for the answers.

To any water conditioning problem Cochrane contributes 89 years of accumulated "know-how". Whether your requirements are for process water or boiler feedwater, Cochrane can show you how to obtain them—economically and efficiently. And since Cochrane manufactures all types of water conditioning equipment, you are assured unbiased recommendations.

When you have a water conditioning problem call on Cochrane. Your requirements will be thoroughly surveyed by a Cochrane Water Engineer... then you'll know you're right. To give you prompt consultation and service, Cochrane Water Engineers are strategically located in 29 cities throughout the United States. Write today for the address of our office nearest you.

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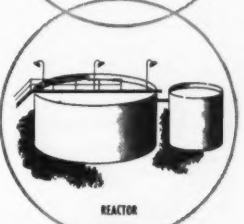
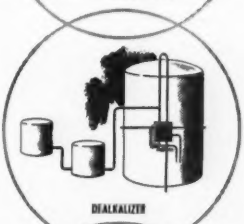
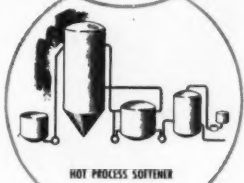
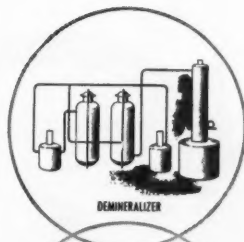
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TEMPERATURE INDICATION, CHOOSE**

*Accurate*  
**AMERICAN BI-METAL  
DIAL THERMOMETERS**

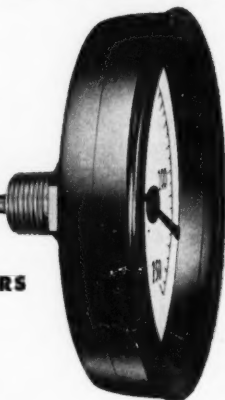


**STOCKED AND SOLD**



**BY**

**LEADING DISTRIBUTORS**



**SPECIFIC NEEDS** of refinery, chemical, power and other plants are met completely by American Bi-Metal Dial Thermometer. It makes accurate "on the spot" temperature readings easy *even from a distance*. It can be used where other types are not nearly so practical—and to avoid the higher cost of a distant reading thermometer. Installation is simple, fast and economical—only a  $\frac{1}{2}$ " or  $\frac{3}{4}$ " N.P.T. tapped hole is required.

The fixed stem contains the highly sensitive bi-metal element. Accuracy of the instrument is guaranteed within 1% of the scale range. In extensive laboratory and field tests, sudden hot blasts, submersion, severe mechanical and thermal shocks, hot gases, dust and long exposure to the elements could not impair its accuracy or destroy the hermetic seal of the case.

Solve your "on the spot" temperature reading problems with rugged, accurate American Bi-Metal Thermometers. Two dial sizes, seven stem lengths, a wide range of temperatures, and the availability of separable sockets make selection easy. Get all the facts. Write for Bulletin 144.

**SPECIFICATION DATA**

**Temperature Ranges:** from minus 60° to 120°F, 200° to 1000°F. **Dial Sizes:** 3½" and 5". Graduations over full 270° arc. **Bezel:** Screwed to case. **Front:** Heavy plate glass set in channelled gasket—hermetically seals the case. **Pointer:** Adjustable type attached with set screw; easy to get at for setting. **Stem:** Stainless steel,  $\frac{1}{4}$ " diameter—lengths from 2½" to 24". Stem and connections welded—strong, corrosion resistant, leak-proof. **Connection:** Fixed,  $\frac{1}{2}$ " N.P.T.

**Separable Sockets** available for use on closed systems or where the measured medium is corrosive to the stainless steel stem. Fit over all standard stem lengths except 2½".



**AMERICAN INDUSTRIAL INSTRUMENTS**

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT  
MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES. BUILDERS OF 'SHAW-BOX' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

# NOW...

# SCREEN FINE, MOIST MATERIALS

**THERMO-DECK**  
Heating Unit

# Without Blinding!

**NO "TIME OUT"** to clear fine or medium mesh screen cloth! You can screen fine, moist non-combustible materials *continuously* with new *Thermo-Deck* heating unit.

**INCREASED CAPACITY!** Heated screen cloth *remains* open, permitting more tonnage through the screen and better separation.

**LOWER COSTS!** Operating records show that heated screen cloth lasts up to three times as long when cloth does not have to be pounded free of blinding material. The *Thermo-Deck* heating unit can be easily applied in the field. Your nearby A-C representative can give you more details. Allis-Chalmers, Milwaukee 1, Wisconsin.



**POWER ON** — *Thermo-Deck* heating unit keeps screen cloth clear on screen handling fine, moist material.



**POWER OFF** — Troublesome blinding results on same screen when *Thermo-Deck* heating unit is turned off.

**Send for...**

New 8-page bulletin containing complete facts on operation and application of the *Thermo-Deck* heating unit.

Bulletin 07B7812

A-3619

Thermo-Deck is an Allis-Chalmers trademark.

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look to

**TRI-CLOVER**

for the best in  
Stainless Steel  
**CORROSION-RESISTANT**  
**FITTINGS · PIPE**  
**TUBING · PUMPS**  
and **CUSTOM**  
**FABRICATION**



### CONICAL END FITTINGS

Fabricated in Stainless Steel Type 316 and other SS analyses. A complete line of ells, tees, crosses, laterals, reducers, etc., in sizes from 1 in. O.D. thru 4 in. O.D. Features: Light weight—low cost—simple, fast installation—leak-tight—sturdy flanges of all types for every application—easily adapted to all other fitting types. Fully annealed and passivated. (Illustrations show a 90° sweep ell and a conical-end tee flanged to standard I.P.S. threaded adapter.)



### SANITARY FITTINGS

### TUBING and PIPE

Tri-Clover "sanitary" type stainless steel fittings are available in sizes from 1 in. thru 4 in. O.D., in a full range of fitting types. Designated and approved as meeting 3-A Standards throughout, incorporating numerous exclusive design and construction features that assure highest quality.

A full line of stainless steel tubing and pipe is available for all corrosion-resistant needs in sizes from 1 in. thru 4 in. O.D.



### INDUSTRIAL and SANITARY PUMPS

Tri-Clover offers a full line of centrifugal pumps for handling clear liquids, heavy liquids and semi-solids of all types, for use on sanitary lines in food, dairy and beverage industries — and for general industrial corrosion-resistant service. Capacities from 10 to 1250 gallons per minute.



**Zephyrweld**

## WELDING FITTINGS



Fabricated in Stainless Steel Type 304, 347, 316 and other SS analyses. Fabricated in I.P.S. and O.D. Tube Size from 1/2 in. thru 36 in.—in ells, tees, crosses, welding nipples, flanges, adapters, etc. Features: Streamlined, sweep ell construction; free-flow; light weight; fully annealed and passivated. A high quality fitting widely used in broad chemical process use.

\* Trade Mark Registered



## RECESSED-END FITTINGS

Fabricated in Stainless Steel Types 304, 347 and 316. Here are low cost, light weight, high quality fittings designed for fast, simple soldering, brazing or socket welding. Available in sizes for an extremely wide range of applications, ranging from 3/4 in. thru 24 in. Full line of elbows, return bends, tees, crosses, adapters, etc. Fully annealed and passivated.



## CUSTOM FABRICATION

When it comes to expert welding and fabricating of complex custom assemblies, you just can't beat the speed and accuracy offered with TRI-CLOVER'S exclusive Heli-Arc Atomic Hydrogen Welding . . . a specialized semi-automatic process that assures highest quality and FULL corrosion resistance (Shown are two examples of the type of "special" jobs we handle every day).

**ILLUSTRATED** here are some of the types of stainless steel fittings, pumps, tubing, pipe and custom fabrication that are included in the complete Tri-Clover line of corrosion-resistant liquid conveying line materials.

Tri-Clover fittings are truly quality fittings. To assure the highest possible degree of corrosion, resistance, all industrial fittings are fully annealed and passivated after fabrication. Modern, precision fabrication to close tolerances precludes any need for reworking during installation.

By installing these stainless steel products in your process lines, you will realize the advantages of increased production and lower maintenance costs. Over 30 years of specialized engineering service is at your disposal in helping to solve your specific corrosion-resistant piping problems.

*Write for details, or see your nearest Tri-Clover Jobber.*

I-252

**Tri-Clover**

**MACHINE CO.**

Kenosha, Wisconsin

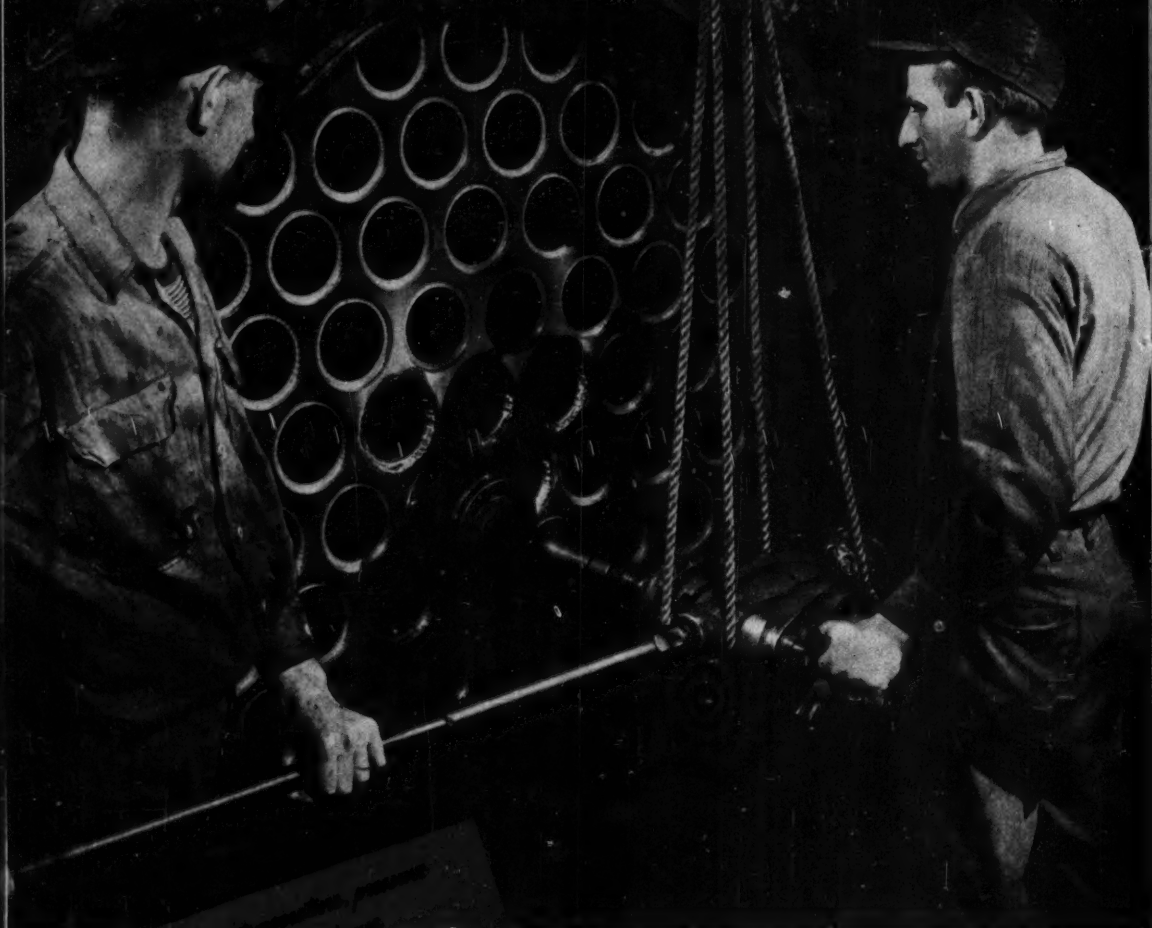
TRI-ALLOY AND STAINLESS STEEL  
SANITARY FITTINGS, VALVES,  
PUMPS, TUBING, SPECIALTIES

FABRICATED STAINLESS STEEL  
INDUSTRIAL FITTINGS AND  
INDUSTRIAL PUMPS

THE Complete LINE



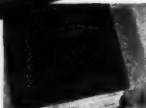
# Special Treatment to Make a Tube Stand Up!



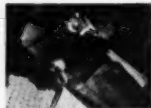
**M. W. KELLOGG**

Be it for high pressure or high vacuum . . . 1800F. or -260F. . . corrosive or erosive service, exclusive manufacturing techniques lengthen the operating life of Kellogg heat exchange equipment.

Pressure Vessels  
Vacuum Vessels  
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Process Piping  
Hi-pressure—Hi-temp  
Power Piping  
Bends and Headers  
Forged and  
Welded Fittings  
Radial Brick Chimneys  
Concrete Chimneys



Confining Back Study of heat exchange by Kellogg development groups over 20 years has produced unduplicated design data.



Shop Layout Craftsmen have had experience on all types of heat exchangers, from marine condensers to jet engine combustion chambers.



Rigid Quality Control is maintained by inspectors reporting directly to Shop Management rather than to Production executives.



Extensive Shop Facilities, from plate forming to stud threading, permit complete fabrication of any type heat exchanger.



Special Shop Techniques—the component parts of each exchanger are fabricated as a production unit, building in the advantages of "tailor-made" fit.

FOR OPERATORS IN WESTERN CANADA:

The Canadian Kellogg Company Ltd. has established complete shop facilities for the fabrication of all types of piping at **GRANBY, Alberta**. Inquire directly or through any Kellogg or Canadian Kellogg office.

Fabricated Products Division, The M. W. Kellogg Company  
New York, Jersey City, Los Angeles, Tulsa, Houston, Toronto, London, Paris

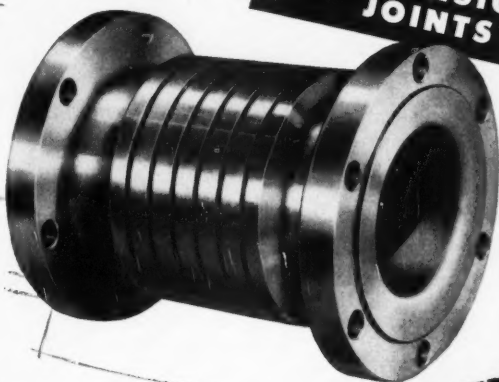




**FLEXONIFLEX**

*High Pressure*

**EXPANSION  
JOINTS**



**Flexonics engineered for pressures up to  
5500 psi!**



*The Flexonics Expansion Joint Design Guide offers helpful data on the selection and application of expansion joints for all services. Write for your copy, today.*

With its Flexoniflex line of expansion joints, Flexonics Corporation offers the first practical, in-line expansion joint for high pressure piping systems. Depending upon size and temperature, Flexoniflex units will handle pressures from vacuum to 5500 psi. Temperatures from  $-400^{\circ}\text{F}$ . to  $1600^{\circ}\text{F}$ . can be accommodated at reduced pressure at the temperature extremes. Sizes range from  $\frac{1}{2}$ " pipe through 6" pipe. Consult Flexonics Corporation's Engineering Department for information on larger sized units.

In construction, Flexoniflex units consist of one or more plies of corrugated stainless steel with integral control rings. They are available with either flanged or welding ends.

If you have high pressure piping we would like to show you how Flexoniflex Expansion Joints can solve your expansion control problems.

**Flexonics**

*Corporation*

**EXPANSION JOINT DIVISION**

**1317 S. THIRD AVENUE • MAYWOOD, ILLINOIS**

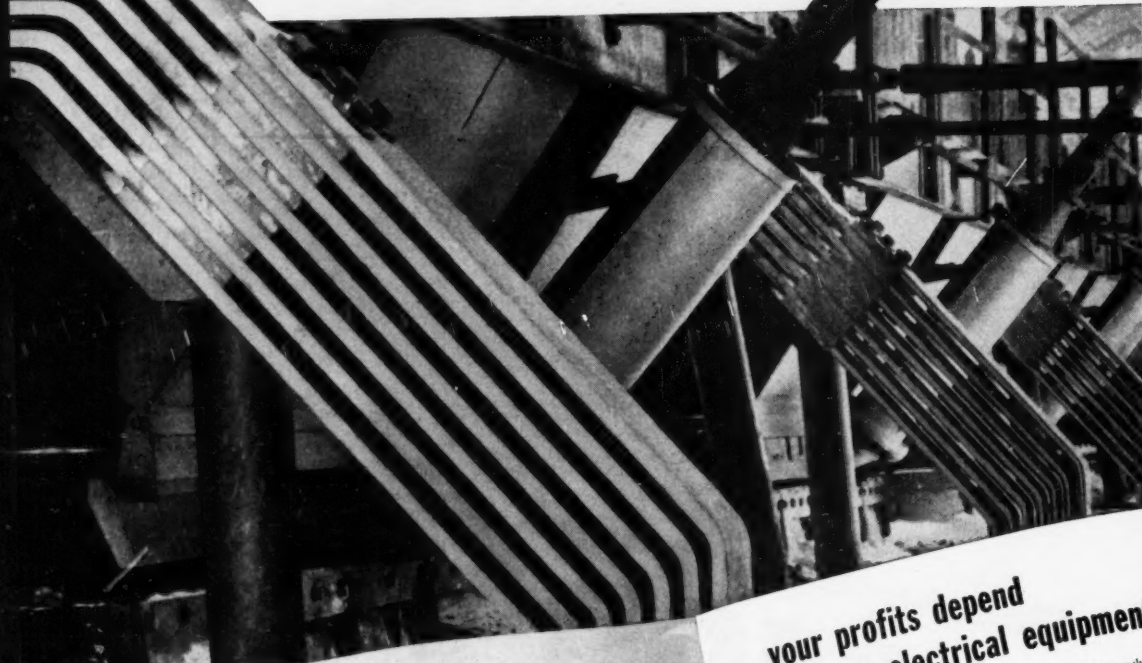
**FORMERLY CHICAGO METAL HOSE CORPORATION**

Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.



Manufacturers of Convuluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components  
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

**They did what you can do  
to produce more**



**your profits depend  
on your electrical equipment**

If you are interested in producing metals by electrolysis—aluminum, chlorine, caustic soda, copper, zinc, etc.—this booklet will give you basic information on the electrical equipment you need. It covers equipment used for large scale operations.

Selection of the right electrical equipment will have an important bearing on the cost of your plant. It is a major capital expenditure in itself, and it has a direct effect on your operating costs. For example:

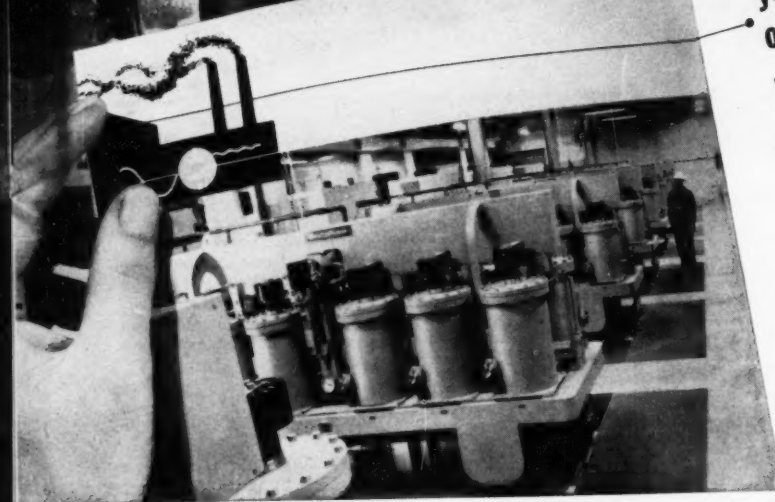
- In an installation requiring 60,000 kw continuously, at 4 mills per kw, every 1% increase in power conversion efficiency cuts \$25,000 off your yearly power bill.
- Often a small improvement in voltage regulation makes a difference in cell operation.
- If you buy a more elaborate power system than you need, you needlessly increase your maintenance costs.
- But if you dump on power equipment, there's a big waste in maintenance costs, too.

**TYPICAL POWER REQUIREMENTS**

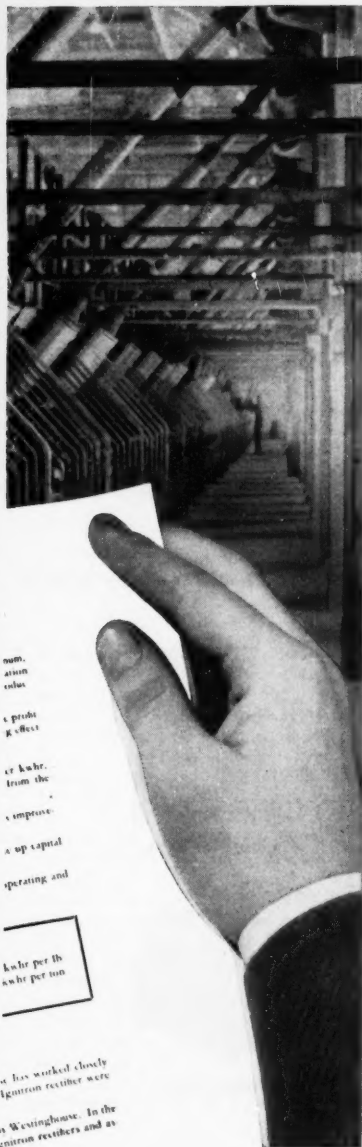
	Aluminum—10 to 11
Copper—150 to 325 kw/hr per ton	Zinc—2000 to 3000
Chlorine—2000 to 3200 kw/hr per ton	Magnesium—10 to 12 kw/hr per lb.

**Westinghouse can give you sound advice  
on this vital apparatus**

Since electrolytic processes were first developed, Westinghouse has been a leader in the industry. Many of the basic developments such as the electrolytic cell, the electrolytic power supply, the electrolytic equipment, etc., have been built by Westinghouse engineers.



# Here's help in planning power for electrolytic production!



This new booklet by Westinghouse can be a valuable aid in planning power for your electrolytic processes. Each method of obtaining d-c power is discussed by Westinghouse engineers, with charts and curves showing the relative advantages of each method.

## **Efficiency gain means thousands annually**

For example, take the matter of efficiency in converting a-c to d-c. A 2% gain means thousands of dollars in the yearly power bill. So this book discusses the efficiency of the various systems—Ignitron rectifiers, M-G sets, and rotary converters, and how the efficiency varies according to operating voltage.

## **Booklet provides vital operating information**

Other important subjects are discussed: how and why Ignitron rectifiers have lowest first cost and high reliability; how M-G sets are best for variable voltage output, and other vital factors. It provides information on determining the best d-c operating voltage and shows why voltage should be as high as possible.

## **Which is the best system for your plant?**

One of the major decisions is whether to buy power or generate your own. There are four popular systems in use: conversion of purchased power, a-c generation and conversion, generation of d-c with steam turbines and with gas engines. This booklet discusses the pros and cons of each system and gives a complete list of the major equipment required.

## **Call Westinghouse early on your project**

This is all an example of the help you can obtain from Westinghouse in planning power for new processes or expansion of present ones. Call Westinghouse early in your plans.

**Write now for "Power for Electrolytic Processes", B-4366, Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa.**

J-94887



YOU CAN BE SURE...IF IT'S  
**Westinghouse**

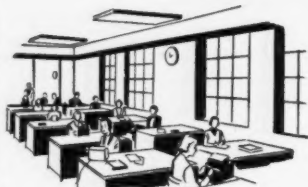
EQUIPMENT FOR  
CHEMICAL PROCESSES



## American Blower... a time-honored name in air handling

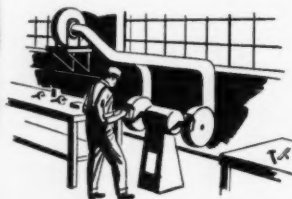


Philadelphia has a conveniently located American Blower Branch Office to provide you with data and equipment for air handling. You can reach American Blower in Philadelphia by calling Rittenhouse 6-8873. In other cities consult your phone book.



### EMPLOYEE COMFORT

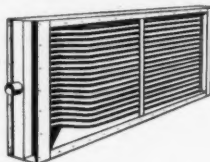
Fresh, invigorating air, indoors, does much to increase employee morale and efficiency. American Blower Ventura Fans are ideal for the job. They're attractively streamlined propeller fans with smooth-flowing lines that harmonize well with modern business interiors. Wiring is fully enclosed for safety. A square mounting panel makes them easy to install. All Ventura Fans are sound-rated and capacities are Certified.



### ABRASIVE MATERIALS

If you've found dust from grinding machine operations hard to handle, American Blower Type V Fans are well

worth investigating. The heavy cast-iron housing of Type V fans easily withstands the wear of hard, gritty, abrasive materials. Also, their volume and pressure range is more than adequate to handle the normal requirements of this type of work. Remember, good ventilation is good business.



### HEATING COILS

Current demands for heating from business and industry are greater now than ever before — a good reason to take early action on American Blower Heating Coils. Whether you need coils for use in blast heating or zone reheating — you'll find the size and type to fit your needs in the American Blower line. All tubing is helically wound with copper or aluminum fins in 3 standard spacings. Casings are heavy galvanized steel; headers are die-formed steel.

### YOUR BUSINESS

Whatever your needs, American Blower heating, cooling, drying, air conditioning and air handling equipment will improve over-all comfort and efficiency in your business. For data, phone or write our nearest branch office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN  
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

YOUR BEST  
BUY

AMERICAN



BLOWER

AIR HANDLING  
EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



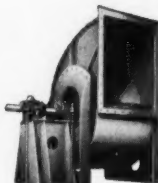
Unit Heaters



Ventura Fans



Centrifugal  
Compressors

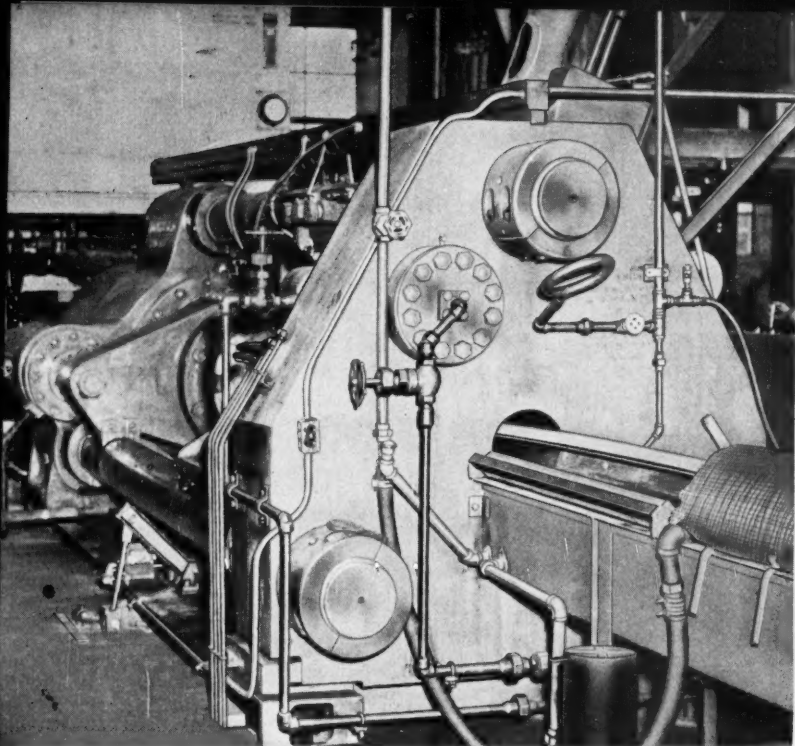


Industrial Fans



Utility Sets





## Puts squeeze on hydraulic press maintenance...

● Shown above is the 1250-ton hydraulic press used by the Light Metals Corporation of Grand Rapids, Michigan, for extruding variously shaped sections of aluminum. When this press was installed recently, officials gave the important hydraulic oil job to STANOIL Industrial Oil. They based that decision on their own experience with this outstanding oil.

That experience covered over four years' use of STANOIL in the hydraulic system of a 315-ton extrusion press. STANOIL has served continuously in this press without being changed or removed for oil maintenance. The hydraulic oil system has never been cleaned and has remained entirely free from deposits and varnish. Hydraulic operation has been efficient at all times.

The experience of the Light Metals Corporation is your assurance of STANOIL's ability to reduce hydraulic system maintenance to a minimum in your plant. This



versatile oil will provide clean, dependable lubrication for such a variety of equipment as air compressors, reduction gears, and electric motors. The Standard Oil lubrication specialists will help you make the most effective use of STANOIL. Phone him at your local Standard Oil (Indiana) office. Or write, Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

## What's YOUR problem?



**D. R. Clay**, of Standard Oil's Grand Rapids, Michigan, office, is the lubrication specialist who has helped Light Metals Corporation keep maintenance of hydraulic units at a minimum through use of STANOIL Industrial Oil.

He is one of many Standard Oil specialists located throughout the Midwest. These men have the practical experience and special training to handle lubrication problems on any type of operation.

Take advantage of the service offered by the lubrication specialist nearest your plant. You can contact him easily by phoning your local Standard Oil Company (Indiana) office. With his help, find how many different oils in your plant can be replaced by STANOIL Industrial Oil on such applications as:

**Air compressors** . . . no sticking or clogging of valves, less oil consumption in splash or circulating systems.

**Speed reducers** . . . less wear of gears and bearings during frequent cold starts or prolonged high-temperature operation.

**Steam turbines** . . . freedom from emulsions and sludge, fewer oil changes necessary.

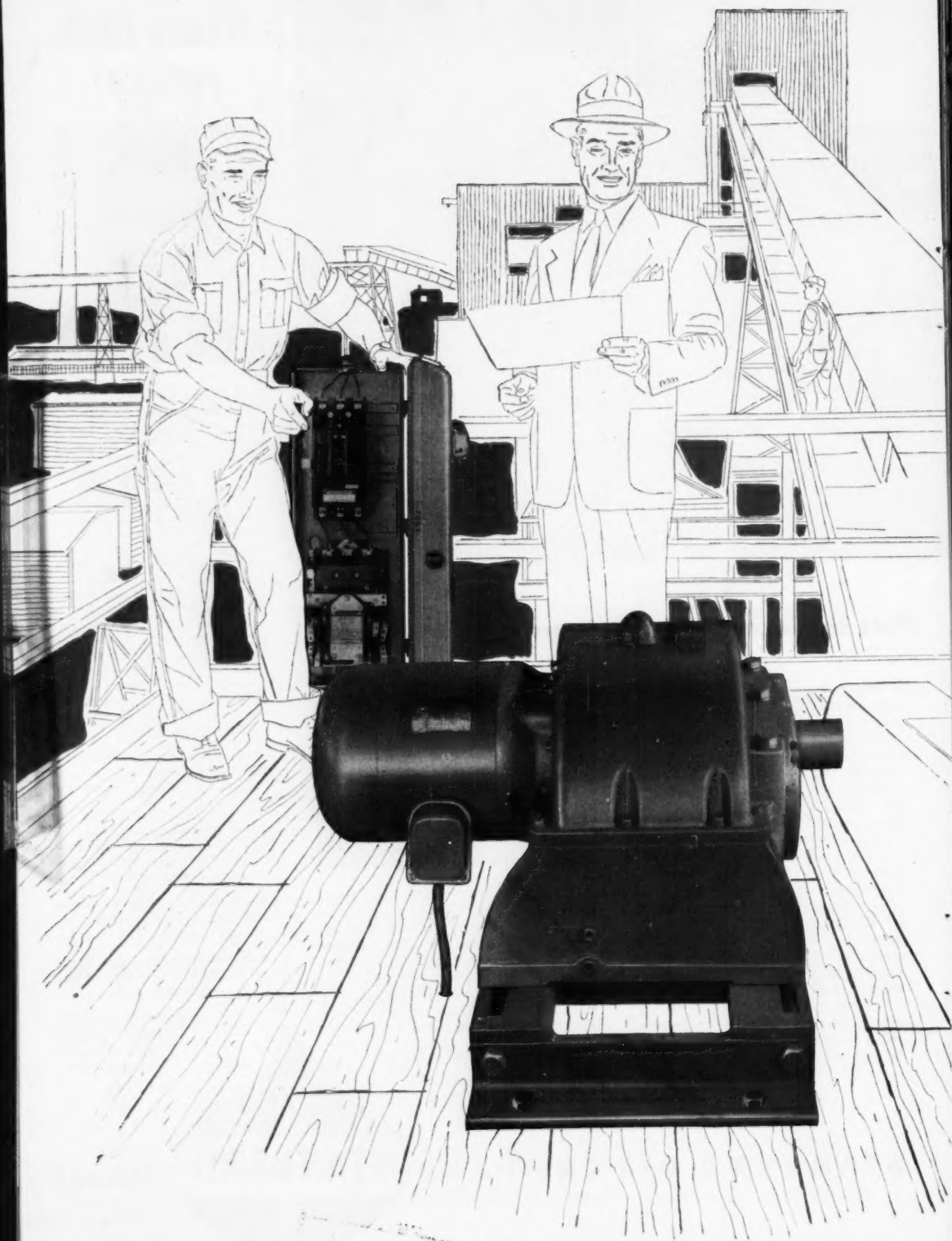
**Ring-oiled bearings** . . . rings function immediately on starting, less bearing wear.

**Circulating and bath systems** . . . one oil for a wide variety of jobs.

**STANDARD OIL COMPANY** **STANDARD** (Indiana)







**"We can service this  
Drive Team faster**

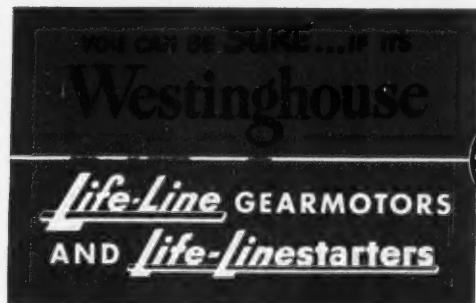
**because all parts  
are more accessible"**

"I'm the fellow who has to live with the gearmotors and controls that we purchase. That's why I'm interested in what it takes to get at the *working parts*. I don't want equipment that only a contortionist could service.

"Take a look at this Westinghouse Combination Life-Linestarter. It offers both circuit and motor protection all in one enclosure. Every screw can be reached from the front—every part can be removed from the front. This saves me considerable time and effort when I have to service the device or change a heater. Installing these starters is simpler too, thanks to the straight-through wiring and pressure-type connectors. I don't have to guess at wire lengths or hunt for terminals.

"Now look at this Westinghouse Life-Line Gearmotor. The split-case construction really is the answer to getting at the working parts. The upper-half case is easily removed for inspecting gears and bearings. I don't have to disturb the alignment or drain the oil. Removing the motor is a cinch. And look! There is no shimmying or motor coupling to realign.

"We've found it's easier to live with our drives when we specify Life-Line Gearmotors and Life-Linestarters." You can do the same. Just call your local Westinghouse representative for full details, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-07304






**BAGPAK**

*...basic\*  
in multiwall  
paper bags*

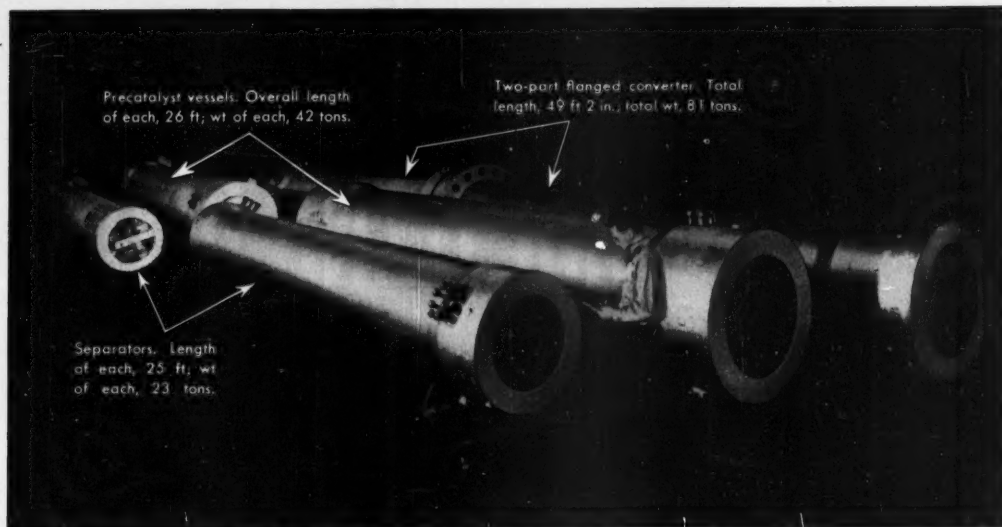
With 15,000,000 acres of multi-grade hardwood woodlands—mostly large pine, paper and forest mills—under heavy management devoted exclusively to products for medium packaging... with three, the International Paper Company and its affiliated companies operate a vast network of new materials facilities and "know-how" for the quality production of Bagpak Multiwall Paper Bags.

Bagpak also furnishes Tug Closing Machines for bulk short haul and machines with Tug Closing Division, International Paper Company, 200 West 42nd St., New York 36, Dept. 5-2.

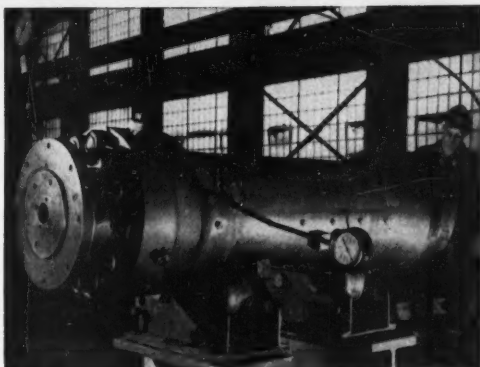
  
**International Paper** COMPANY

BRANCH OFFICES: Atlanta • Baltimore • Baxter Springs • Boston • Chicago • Cleveland • Denver • Detroit • Kansas City • Kansas • Los Angeles • New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco • St. Paul • Toronto

**BAGPAK DIVISION**



# We'll Build



## YOUR Kind of Vessel

Bethlehem builds pressure vessels for many different customers in different lines of business. Often we have a number going through at once; and like as not, these vessels will be as different as the customers who order them.

At Bethlehem we are equipped to produce forged vessels of almost every size and type . . . reactors, filters, converters, separators, high-pressure accumulators, etc. These units can be of single- or multiple-section design, whichever the specifications require. The point is, our facilities don't limit us to one or two conventional types of vessels. We turn out a good many orders that call for some pretty special engineering.

So the next time your company is planning forged vessels, check with us, won't you? We'll handle the whole job, beginning with the making of the steel and following through to the final inspection.

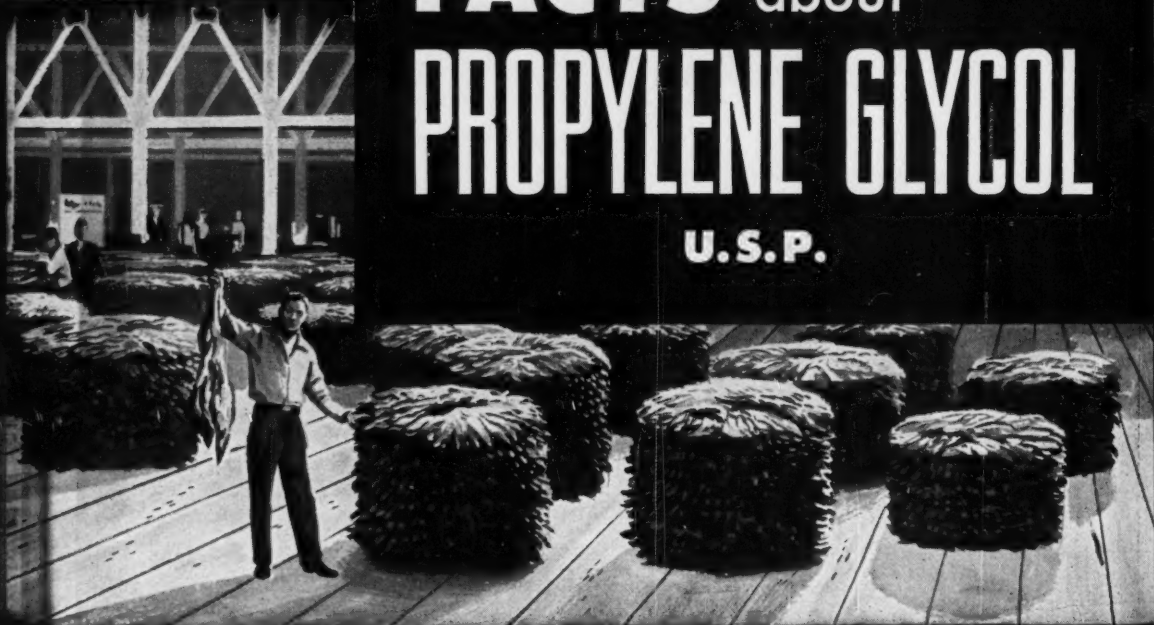
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.  
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



# *Bethlehem* FORGED-STEEL PRESSURE VESSELS

# FACTS about PROPYLENE GLYCOL

**U.S.P.**



**P**ROPYLENE GLYCOL, U.S.P., made by The Dow Chemical Company, is a product of consistent, high purity prepared specifically for tobacco, food, drug and cosmetic use. The fact that it meets the high standards required for inclusion in the United States Pharmacopoeia indicates its applicability to pharmaceutical preparations, as well as to foods and cosmetics.

To assist you in evaluating the functions of propylene glycol, U.S.P. in your product, Dow presents the following information on a number of practical uses for this highly efficient chemical.

**THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN**

## **PROPERTIES and General Uses**

An outstanding characteristic of propylene glycol, U.S.P. is its solubility in all proportions in water. Moreover, it will dissolve and put into water solution many organic chemicals. Thus, it is widely used in the preparation of foods, flavors, cosmetics and pharmaceuticals.

Propylene glycol is also an extremely effective softening and moistening agent, as indicated by the hygroscopic quality of water solutions containing large amounts of the chemical, plus its characteristic plasticizing action. As a moisture control agent, it is used in tobacco for cigarettes. Propylene glycol also inhibits mold growth. It is used to extend the shelf life of certain foods, as well as to prevent mold contamination of idle food machinery.

### **ADVANTAGES OF PROPYLENE GLYCOL, U.S.P.**

1. Odorless
2. Relatively tasteless
3. Low volatility
4. Acceptable in foods
5. Emulsifying aid
6. Wetting agent
7. Humectant
8. Preservative
9. Plasticizer
10. Excellent solvent

### **DOW PROPYLENE GLYCOL, U.S.P.**

Conforms to or exceeds the specifications  
established by the U.S. Pharmacopoeia XIV (1950)

#### **INTERPRETATION OF U.S. PHARMACOPOEIA SPECIFICATION**

Specific Gravity @ 25/25°C.....	1.035-1.037
Distillation Range (Method 2 U.S.P. XIV) I.B.P.-D.P.....	185-195°C.
Identification.....	Passes Tests
Ash.....	Not more than 0.007%
Acidity (As Acetic Acid).....	Not more than 0.0115%
Chloride.....	Not more than 0.07%
Sulfate.....	No Turbidity*
Heavy Metals.....	Not more than 5 p.p.m.
Arsenic (as As <sub>2</sub> O <sub>3</sub> ).....	Not more than 2 p.p.m.

\*Method: Dilute 5 cc. of propylene glycol with 15 cc. of distilled water and add 5 drops of Hydrochloric Acid and 5 drops of Barium Chloride T.S.



*This is one of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.*

## Propylene Glycol in FOODS



Because of its solvent, preservative, hygroscopic and wetting properties, and especially because of its economy in use, propylene glycol has found wide acceptance in the food field. Apparently, the only class of flavoring raw materials not sufficiently soluble in propylene glycol for the practical preparation of flavor solutions is the citrus oils. However, by using edible wetting agents, it is possible to prepare a 5% orange oil colloidal dispersion in propylene glycol which, to all appearances, will be a solution.

In addition to the preparation of flavor solutions, propylene glycol, U.S.P. is being used as a solvent for the extraction of vanilla flavor from vanilla beans and also in the preparation of a coffee flavor from ground roasted coffee. As a corollary to the flavor use of propylene glycol, many manufacturers have found that it makes an excellent food color solvent and that its use necessitates only very slight alterations in basic food color formulas.

Another interesting and relatively undeveloped use of propylene glycol is in increasing the effectiveness of shortening in the production of baked goods. Apparently the emulsifying or wetting action of the chemical aids in the dispersion of the shortening throughout the batch. Much investigation remains to be done on this phase of propylene glycol use, but it is apparent that a definite benefit can be obtained.

Being a hygroscopic material, propylene glycol in sufficient concentrations tends to attract moisture from the air and, as a result, baked goods, to which a very small proportion of propylene glycol has been added, have a considerably enhanced shelf life.

This preservative action, so apparent in the use of propylene glycol in baked goods, points logically to its use in other food products which require a preservative. Actual laboratory tests have shown that a 15% concentration of propylene glycol will inhibit the growth of mold on nutrient media, and it is quite possible that a smaller concentration would retard the growth of spoilage organisms under less ideal growing conditions. Although the subject has not been fully explored, there is reason to believe that many solid foods can be placed on the market in better condition through the use of small quantities of propylene glycol.

## PHARMACEUTICALS



The same qualities which make Dow propylene glycol, U.S.P. useful in food and flavoring preparations can be of great assistance in preparing pharmaceutical formulas. Here it acts as a carrier, solvent, emollient, humectant, lubricant and preservative.

The manufacturer of pharmaceutical preparations, whether for internal consumption, topical application or injection, must first solve the problem of finding a solvent which, in addition to being a good carrier, forms an acceptable medicinal. Propylene glycol, U.S.P. has been used in many approved pharmaceutical preparations and, in many cases, its preservative action is of considerable importance.

The versatility of the solvent properties of propylene glycol, U.S.P. applies to many organic chemicals used in the field of chemotherapy. Its use therefore should be considered in many estrogens, antiseptics, salves, elixirs, ointments and other types of pharmaceutical preparations.



## COSMETICS

Dow propylene glycol, U.S.P. is used as a carrier, emollient, humectant, and preservative in many types of cosmetics. A great number of manufacturers of creams, lotions and similar products have discovered the advantages of propylene glycol's soothing and softening effect without residual stickiness. Propylene glycol can often be used in place of a more expensive ingredient and often will yield a superior product. In many cases, the addition of propylene glycol requires only a very slight change in the old formula to provide a high quality cosmetic.

Propylene glycol has been found effective in the preparation of lotions (whether non-alcoholic, mildly alcoholic or strongly alcoholic), cold creams and "all purpose" creams, hormone creams, vanishing creams, practically every type of facial make-up, permanent waving solutions and wave set solutions, shaving creams, soaps, shampoos and sun tan preparation.

*This material is presented for what assistance it may give and is merely to be taken as indicative of the characteristics of DOW propylene glycol, U.S.P. and is not to be construed as specific recommendations.*

### WRITE DOW FOR INFORMATION AND TECHNICAL ASSISTANCE.

The Dow Chemical Company, Dept. OC12,  
Midland, Michigan

- ☐ Please send \_\_\_\_\_ reprints of this advertisement.  
☐ Please send me additional literature about propylene glycol, U.S.P.

Name \_\_\_\_\_ Title \_\_\_\_\_

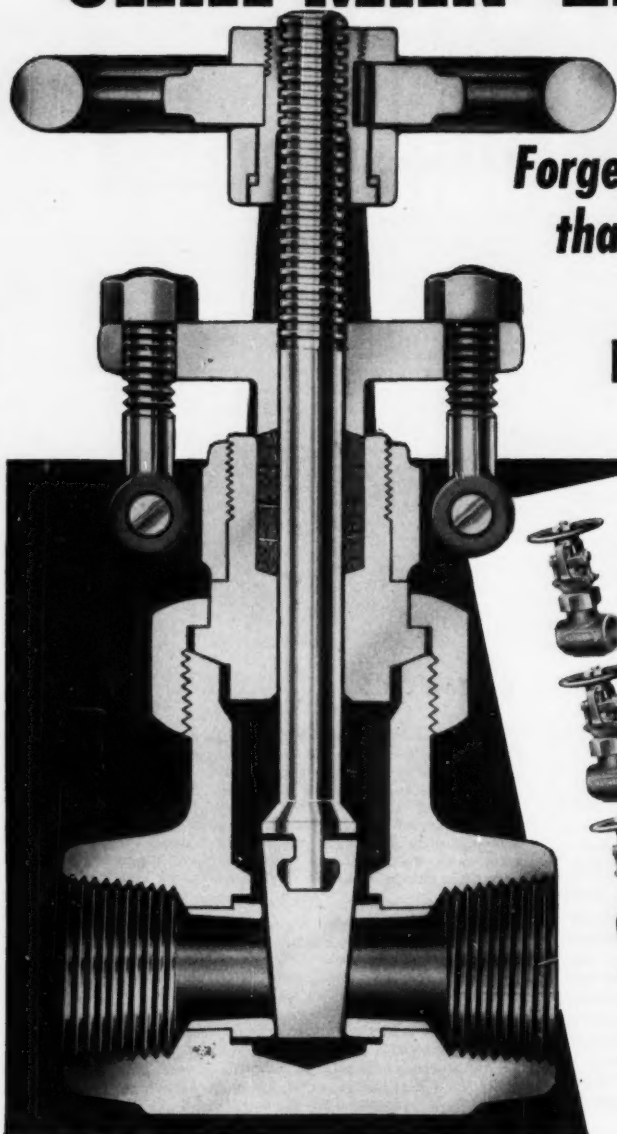
Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



# CHAPMAN LIST 960



*the one*  
**Forged Steel Gate Valve**  
*that gives you this*  
**4-WAY**  
**PROTECTION**

Extra Protection Against Even Unusual Stress is provided by extra-strong stem-and-wedge-gate connection.

Repairs and Replacements Are Reduced by super-hardened seat rings and gate faces of stainless steel.

Longer-Lived Body and Yoke are of forged steel. And bolted follower has no threads on yoke to corrode.

No Seizing or Galling of Gate Faces because List 960's gates (when furnished with certain types of trim) are hardened by Malcomizing (patented Chapman process) to a minimum of 800 Brinnell.



An exceptionally wide range of services is covered by this small forged steel gate valve . . . giving you the same consistent top level performance on many different jobs.

Chapman List 960 Forged Steel Gate Valves are manufactured in sizes from  $\frac{1}{2}$ " to 2" inclusive, and in these 2 types: (1) Rising stem with yoke (shown), and (2) Rising stem with inside

screw. Bonnet joints are either gasketed or metal-to-metal. Pressure range: 2000 lb. at 100°F. — 380 lb. at 1000°F. For higher pressures, specify List 990. Send for illustrated Catalog No. 10.

**THE CHAPMAN VALVE MFG. CO., INDIAN ORCHARD, MASS.**

**FAIRBANKS-MORSE DIESELS CAN ELIMINATE YOUR**

# Power Checkmate

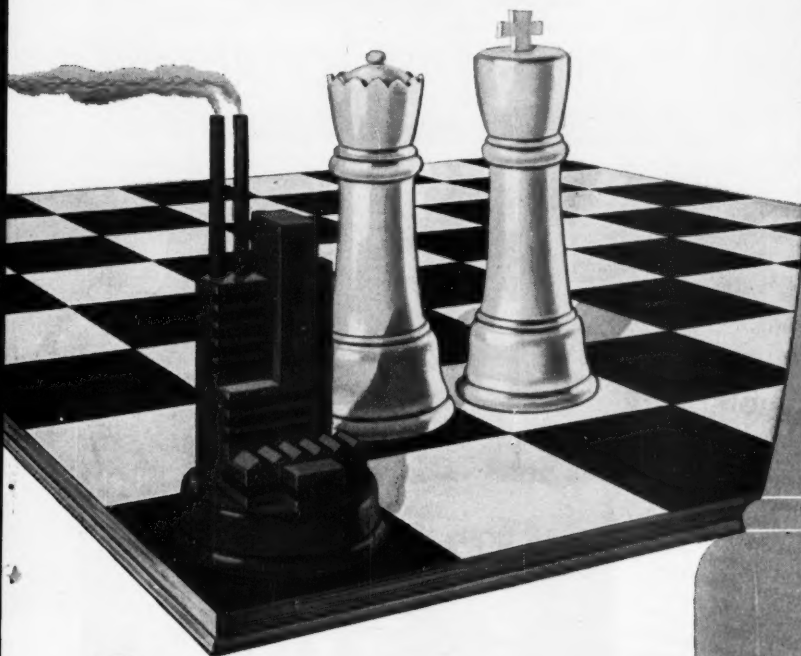
Poor power factor, adverse current characteristics, surge loads . . . any one of these conditions can put your plant in a power checkmate. You are then paying a penalty that can mean the difference between profit and loss.

## What's the Next Move in Your Plant?

Look at your power problem. Then look at this representative list of advantages brought to you by Fairbanks-Morse Diesel power generation. These

are *proved* answers to your problem . . . based on over 50 years' experience in industrial and municipal power generation.

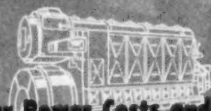
If power has you in a checkmate, write us today, outlining your problem. Fairbanks-Morse Engineering can help decide your next move to put power costs and performance in order. Fairbanks, Morse & Co., Chicago 5, Ill.



## FAIRBANKS-MORSE,

**a name worth remembering**

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM-MACHINERY



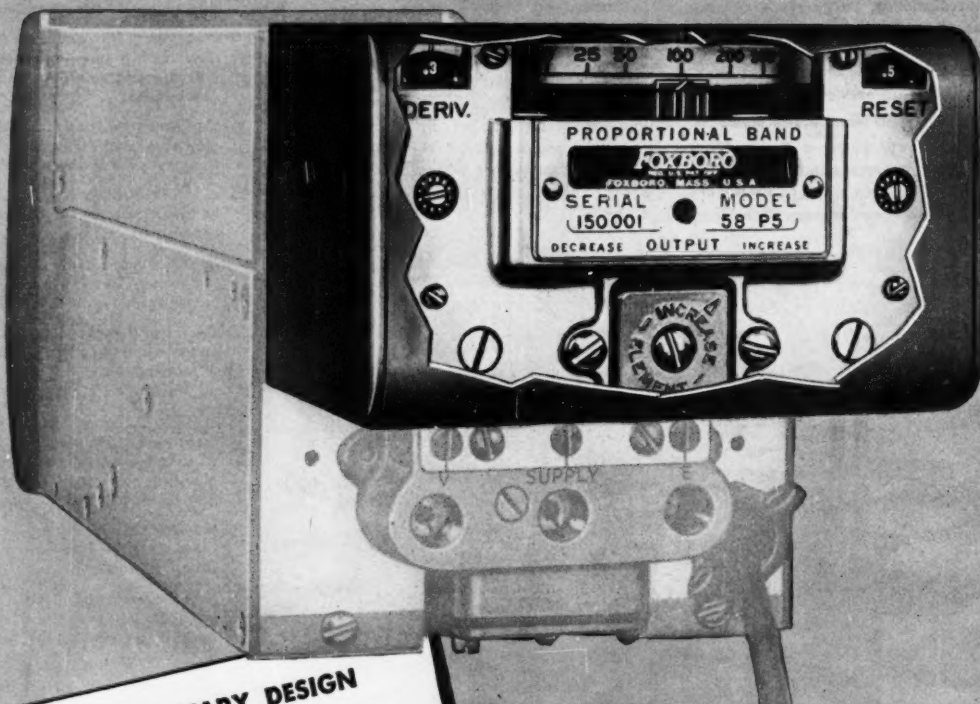
## Put Your Power Costs and Performance in Order

- 1 **Handle Peak Demand** . . . reduce peak demand values for lower purchased power rates.
- 2 **Power Factor** . . . in-plant power generator can eliminate power factor penalties.
- 3 **Emergency Power** . . . insurance against lost production and damage resulting from line failures.
- 4 **Handle Surge Loads** . . . that may now be affecting current characteristics of entire plant.
- 5 **Plant Expansion** . . . need not be restricted due to lack—or expense—of ample power.
- 6 **Useful Heat** . . . lube oil, water and exhaust heat can be turned from waste to profit.
- 7 **Chemical Value** . . . exhaust gases are high in free nitrogen—available for economical fixation of nitrates, ammonia, etc.
- 8 **Insurance Advantage** . . . of diesel over gasoline engine, for example, will soon pay for installation.
- 9 **No Weather Worries** . . . ice, snow, sleet, wind storms can't stop plant operations.
- 10 **Handle Increasing Load** . . . in-plant power economically adds to current capacity as loads increase.
- 11 **Fuel Economy** . . . use diesel oil, natural gas or sewage gas for added economy.
- 12 **Remote Locations** . . . distance from transmission lines needn't curtail plant expansion.
- 13 **More Compact Power** . . . Fairbanks-Morse engines give you more power per foot of floor space, more power on present foundation.
- 14 **Minimum Attendance** . . . Fairbanks-Morse in-plant generating sets require far less supervision or maintenance.
- 15 **Save Cost** . . . of running in new line where present transformers and power lines are already loaded.

The New

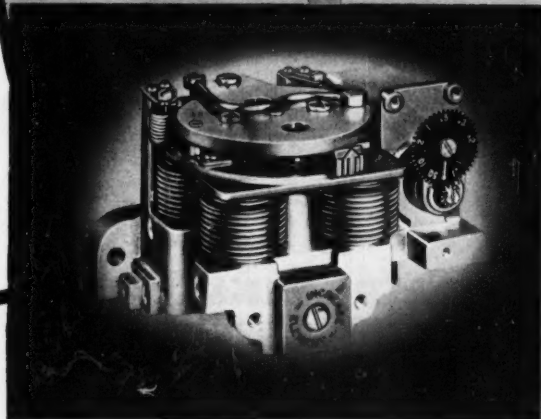
# CONSOTROL

*Radically new operating principle . . .  
Simplest Installation*



## REVOLUTIONARY DESIGN

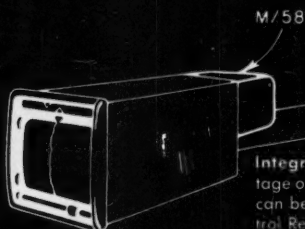
The unique Foxboro "floating-disc" balancing system is shown at right with dial-set reset unit. Dial-set derivative unit is plugged in at left of assembly (see above). Conversion from proportional to reset and/or derivative action can be made in the field, in a matter of moments, with only a screwdriver! New design adjustable restrictors provide 1000:1 rangeability, perfect reproducibility, and consistent rates on both increasing and decreasing air pressure. Proportional band is a lever setting, fully adjustable from 0 to infinity.





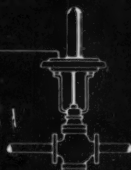
# M/58 CONTROLLER

## COMPLETE FLEXIBILITY OF INSTALLATION

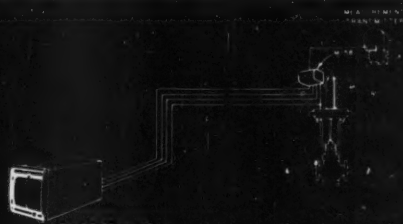


**Integral-Mounting** — An important advantage of the M. 58 Consotrol Controller is that it can be attached directly to the M. 53 Consotrol Recorder. Eliminates cost of mounting and of piping between panel-mounted recorder and the controller.

MEASUREMENT TRANSMITTER



**Rack-Mounting** — For special-purpose installations, the M. 58 Controller can be rack-mounted and piped to the M. 53 Consotrol Recorder or comparable unit.



**Field-Mounting** — Maintenance-free design and weatherproof, all-metal construction readily permit this usage when the process requires it.

Over and above its extreme compactness for graphic panel use, the new Foxboro M/58 Consotrol Controller offers unique advantages in its simplicity of design, unmatched performance, and ease of installation.

This Controller employs an exclusive, simplified balancing system in which the measurement, proportional, reset, and derivative bellows act on a single "floating-disc". With no diaphragms, only one nozzle, and only one moving part, it gives control action unrivalled in stability, sensitivity,

and with positive, drift-free control point.

Installation, also, is radically simplified. The M/58 is designed to attach directly to the M/53 Consotrol Recorder (eliminating cost of piping and mounting) or, optionally, to be mounted in remote locations if required.

Write for Bulletin 463 containing full details of the M/58 Controller together with the full line of Consotrol Instruments. The Foxboro Company, 3611 Neponset Avenue, Foxboro, Massachusetts, U. S. A. Branches in principal cities.

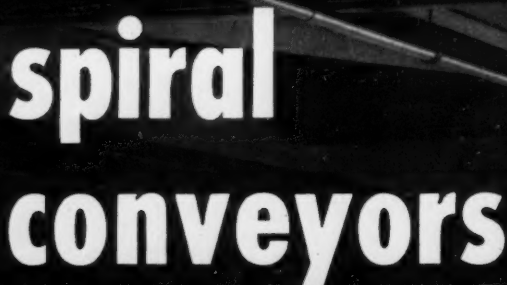
## FOXBORO instruments

Reg. U.S. Pat. Off.

INDICATING • RECORDING • CONTROLLING

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND





# spiral conveyors

**A complete line of Flights and Accessories for new and replacement service. A compact conveyor — no return strand — can be made dust-tight.**

**Catalog No. 803-B**

# THE JEFFREY



FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

## Valve body distortion no problem for this valve!

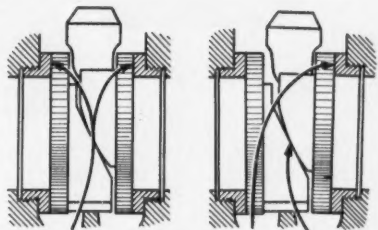
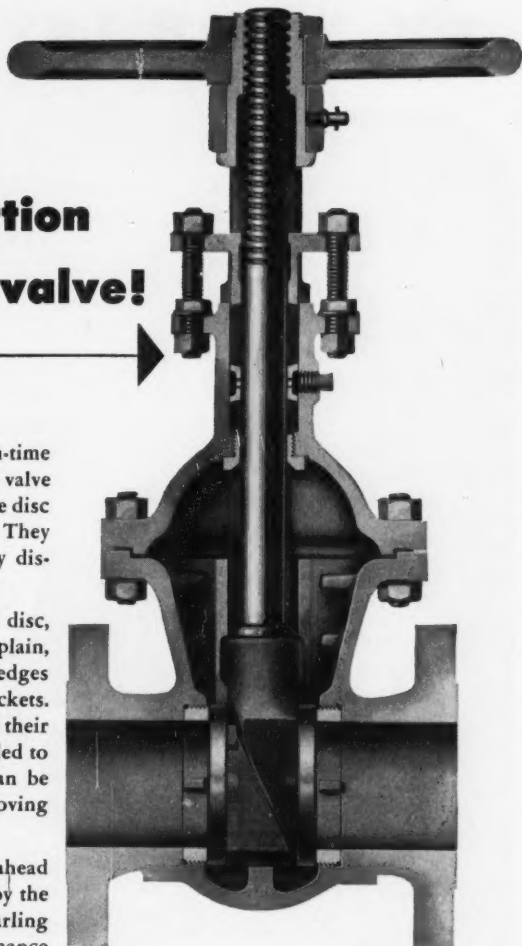
**D**ON'T let costly valve maintenance and down-time headaches get you down! Lick these common valve troubles by installing Darling fully revolving double disc gate valves, with their unique wedging principle. They adjust *automatically* to compensate for valve body distortion—cinching tight, leak-proof closure.

The difference is in the fully revolving double disc, parallel seat principle of Darling valves. Just two plain, interchangeable no-pocket discs and two rugged wedges do all the work. Discs are completely free of pockets. Sediment and scale cannot collect to interfere with their free movement. No links or other devices are needed to hold the discs and wedges together. Any part can be quickly and inexpensively replaced without removing valve from the line.

It's easy to see why Darling valve users are money ahead because of the exceptional service made possible by the Darling design. That's why in plant after plant Darling gate valves are giving longer, trouble-free performance with minimum attention.

Darling features add up to gate valve service at its low-cost best! Send for the free Darling Valve Bulletin, today.

**NOTE:** Darling gate valves are made in a wide range of sizes, types and constructions, including solid and slotted taper-seat wedge types for all kinds of normal and corrosive services in pressures up to 1500 pounds.



Discs and seats are parallel.

Seats are forced out of parallel by body distortion but discs adapt themselves to give positive closure.

Radius face of wedge allows discs to adjust tightly against both seats.

## DARLING VALVE & MANUFACTURING CO.

Williamsport 3, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd. Galt 19, Ontario

# DE LAVAL

## IMO PUMPS

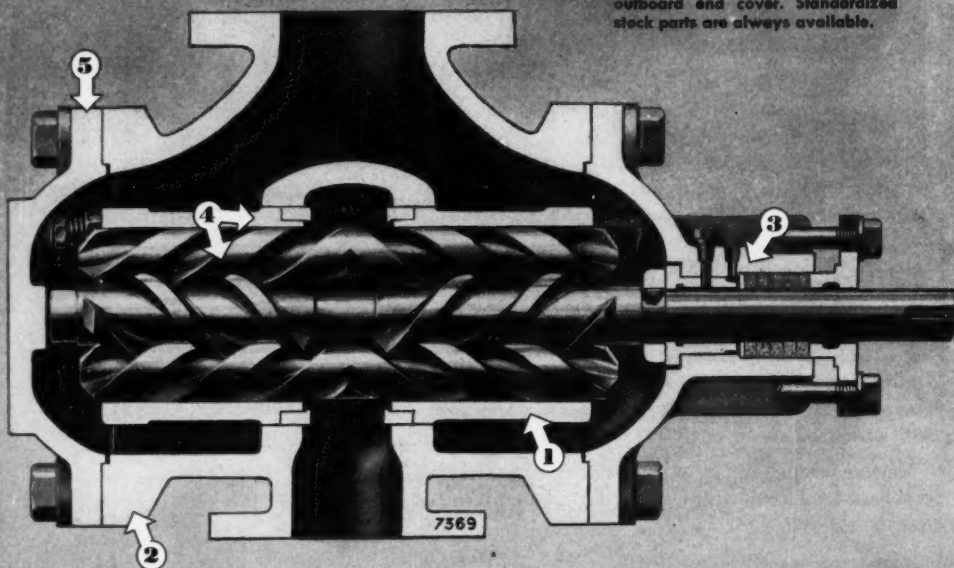
*are versatile*

*Look at these design features*

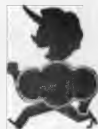
CAPACITIES TO 1,000 GPM

PRESSURES TO 1,500 PSI

- ① **MEEHANITE ROTOR HOUSINGS (LINERS)**—De Laval is specially licensed by Meehanite to produce this high quality alloy iron.
- ② **MEEHANITE CASING**—Simple, one-piece, rugged construction—hydrostatically tested to 150% of maximum working pressures.
- ③ **STUFFING BOX**—Extra deep, subject only to suction pressure. A needle valve controlled seal is provided for pumps operating on suction lift.
- ④ **ROTORS AND HOUSINGS** can be replaced without reboring the case or using oversize rotors.
- ⑤ **EASY MAINTENANCE**—To replace rotors and housings, simply take off outboard end cover. Standardized stock parts are always available.



# "moving men" for viscous fluids



## Only 3 Moving Parts

The action of the De Laval-IMO pump is extremely simple. This unique pump has only three moving parts—a power rotor and a pair of sealing or idler rotors. There are no pilot gears, no sliding vanes, no reciprocating pistons . . . nothing to get out of order or need adjustment. Smoothly intermeshing IMO rotors propel the fluid axially without churning, pocketing or pulsation. There's no noise, vibration or hydraulic whine, even at high speeds. De Laval-IMO pumps are compact . . . can be directly connected to electric motors, turbines or other high speed drivers without reduction gearings, belts or chains.



Keeping viscous fluids "on the move" is a job De Laval-IMO rotary pumps do well throughout the process industries. Designed with the unique IMO principle, these quiet dependable pumps have proved their versatility in scores of applications. For example:

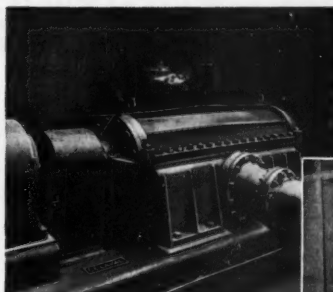
*A bag manufacturer uses IMO pumps to remove paste from barrels and transfer it to the point of use on the machine. Each pump delivers approximately 2.5 gpm against 10 psi discharge pressure.*

*A sugar company specifies these rotary positive displacement pumps for handling molasses with a viscosity ranging from 17,000 to 25,000 SSU. Large IMOs deliver 350 gpm against a discharge pressure of 60 psi when operating at 280 rpm.*

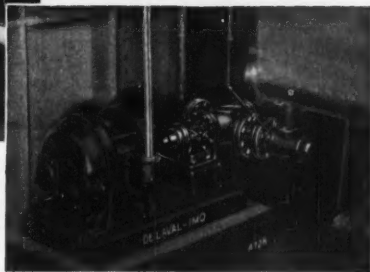
*A synthetic fibre plant handles "slurry" running as high as 1,000,000 SSU with De Laval-IMO pumps. They reach capacities of 6-16 gpm at pressures as high as 450 psi at speeds of 150-450 rpm.*

*Several rayon mills have standardized on De Laval-IMO pumps for handling viscose. Models are available for capacities to 200 gpm against discharge pressures to approximately 160 psi.*

These versatile pumps are also being used to handle *varnish, liquid latex, glue, chilled shortening, linseed oil, resin, soya oil, corn syrup* and many other viscous fluids. Models can be furnished for almost any fluid handling problem. Write for your copy of Bulletin LG describing the wide range line of De Laval-IMO pumps.



A 700 gpm transfer pump handling 8,500 SSU oil at 70 psi in a large mid-west refinery.



A De Laval-IMO pump drawing chilled shortening from picker box of chilling rolls and delivering under 500 pounds per square inch to packaging stand.



## DE LAVAL

## IMO Pumps



DE LAVAL STEAM TURBINE COMPANY  
Nottingham Way, Trenton 2, New Jersey

# Here's the Big Difference!



## TAPER-LOCK

*-The Sheave that always runs true!*

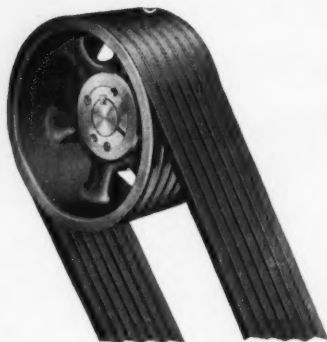
**T**he Taper-Lock bushing seats evenly along the entire length of the hub. It is self-seating. There is no collar—no protruding part—no flange to prevent uniform compression.

With full contact, Taper-Lock sheaves run true. Made of finest grade of close-grained semi-steel, cast in the Dodge foundry. Precision grooves have identical pitch diameters so that every belt can pull its share of the load.

Sheave and bushing mount as a unit—easy to align on the shaft. Grips the shaft like a shrunk-on fit. Flush hub means safety.

**THERE IS ONLY ONE TAPER-LOCK** (a patented product of Dodge). Available from distributors' stocks in a complete range of sizes in A-B combination, B, C and D grooves. Also ask your distributors for Dodge Sealed-Life V-Belts. **WRITE** for complete data.

DODGE MANUFACTURING CORPORATION, 200 Union St., Mishawaka, Indiana



# DODGE

of Mishawaka, Ind.



**CALL THE TRANSMISSIONEER**  
your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified phone book.

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,  
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

November 1952—CHEMICAL ENGINEERING



# Fast Motor Service Wherever You Are

**"Certified"**

Factory approved motor service in every  
industrial area from 97  
Allis-Chalmers Certified Service Shops.

## ALABAMA

Birmingham—Elec. Repair & Serv. Co.  
Montgomery—Standard Electric

## ARIZONA

Bisbee—Copper Electric Co. Inc.  
Phoenix—Daley Electric Company

## CALIFORNIA

San Diego—Calif. Elec. Works  
Los Angeles—Larsen-Hague Elec. Co.  
Oakland—T. L. Rosenberg Co.  
San Francisco—Weidenhof-Gaslinier

## COLORADO

Denver—Baker Electric Company

## CONNECTICUT

Hartford—Charles H. Lippert  
Waterbury—Elec. Motor Repair Co.

## FLORIDA

Jacksonville—Turner Electric Works  
Miami—Peninsular Armature Works  
Tampa—Tampa Armature Works

## GEORGIA

Albany—Georgia Electric Co.  
Atlanta—Beardon-Thompson Elec. Co.  
Columbus—Smith-Gray Electric Co.

## ILLINOIS

Chicago—Chicago Electric Co.  
Marion—Giles Armature & Elec. Wks.  
Mt. Vernon—Dawzer Electric

## INDIANA

Indianapolis—Scherer Electric Co.  
Evansville—Evansville Elec. & Mfg. Co.

## IOWA

Sioux City—Smith Elec. & Supply Co.

## KANSAS

Salina—Cent. Kans. Elec. Mach. Co.  
Wichita—Tarrant Electric Mach. Co.

## LOUISIANA

New Orleans—Industrial Elec., Inc.  
Shreveport—Shreveport Arm. & Elec.

## MAINE

Brewer—Stanley J. Leen Co.

## MARYLAND

Baltimore—Keystone Electric Co.

## MASSACHUSETTS

Lawrence—Roland B. Gilies Co.  
Roslindale—Ranney Electric Motors  
Springfield—Elec. Motor Repair Co.

## MICHIGAN

Detroit—Stecker Electric Company  
Grand Rapids—Grand Rapids Ind. Elec.  
Saginaw—Banning Elect. Prod. Corp.

## MINNESOTA

Duluth—Mielke Electric Works  
Minneapolis—Parsons Elec. Co.

## MISSISSIPPI

Vicksburg—Ludke Electric Co., Inc.

## MISSOURI

Kansas City—Boese-Hilburn Elec. Co.  
St. Louis—Franch-Garlemann Elec. Co.  
Springfield—Springfield Elec. Serv.

## NEBRASKA

Omaha—Omaha Electrical Works

## NEW HAMPSHIRE

Concord—A. S. Tracy

## NEW JERSEY

Atlantic City—Charles A. Buckley  
Paterson—Elec. Services Repair Co.  
Tranton—Lockwood Elec. Motor Serv.

## NEW MEXICO

Albuquerque—Electric Motor Company  
Powell Electric Co.

## NEW YORK

Buffalo—Robertson Electric Co.  
Jamestown—A. E. Westburgh  
Mt. Vernon—H. A. Schreck, Inc.  
New York—Consol. Elec. Motor Co.  
Rochester—Vanderlinde Elec. Corp.  
Utica—Mather, Evans & Diehl Co.  
Watertown—Watertown Elec., Inc.

## NORTH CAROLINA

Charlotte—Southern Elec. Service Co.  
Greensboro—Southern Elec. Serv. Co.  
Rocky Mount—Hammond Elec. Co.

## OHIO

Cincinnati—Cincinnati Elec. Equip.  
Electric Service Co.  
Akron—A-C Supply Co.  
Toledo—Romanoff Elec. Motor Serv.  
Youngstown—Winkler Electric Co.

## OKLAHOMA

Miami—Miami Armature Works  
Oklahoma City—Southwest Elec. Co.  
Tulsa—Smith-Milligan Electric Co.

## OREGON

Eugene—Kalen Electric & Mach. Co.  
Portland—Milwaukee Mach. Co.

## PENNSYLVANIA

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Osceola Mills—Mid-State Elec. Eng. Co.  
Philadelphia—Elec. App. & Repair Co.  
Pittsburgh—Penn. Elec. Coil Corp.  
York—Industrial Electric Company

## SOUTH CAROLINA

Greenville—Southern Elec. Serv. Co.  
Spartanburg—Southern Elec. Serv. Co.

## SOUTH DAKOTA

Sioux Falls—Electric Motor Repair

## TENNESSEE

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LaFollette—Standard Arm. Works  
Memphis—Indus. Elec. & Supply Co.

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Beaumont—Elec. Mach. & Repair  
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Fort Worth—Central Electric Co.  
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## UTAH

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# ALLIS-CHALMERS



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*Versus*

ROH

**P**URE alcohols usually are not corrosive.

However, under certain conditions, in aqueous solutions, or in combination with other chemicals, they can and do give trouble. Alcoholic solutions of acids and bases, tinctures, and the use of denaturants offer a complicated picture of corrosive attack. Additionally, the organic nature of alcohols warrants special consideration in their use with the TYGON family of plastic compounds.

The TYGON family is a series of vinyl based compounds—selected polyvinyl resins carefully modified with other materials to give the maximum in general chemical resistance and physical properties. There are a number of standard and special compounds available in the form of calendered or press-polished sheeting, molded goods, extrusions, paint and plastisols. Some are non-toxic, others are not. Some are glass-clear, some are glossy black, still others are available in practically any color. A wide range of physical and mechanical properties are exhibited. Many different types of applications are possible.

In any of its forms, TYGON displays excellent resistance to both simple and polybasic alcohols in any concentration. Service temperatures are limited only by the boiling points of the alcohols involved. Where alcohols are used in combination with other chemicals, preliminary tests or the counsel of U. S. Stoneware engineers is advised. In these cases, the particular additives used govern the suitability of TYGON and its service limits.

Because of the organic nature of the two materials, a certain amount of trace extraction takes place whenever TYGON is used in full contact with alcohols. The total extraction is very low—almost negligible. It usually results in a slight hardening and stiffening, a slight loss of weight and a slight color change. Generally speaking, these

changes are barely noticeable and do not affect the protectability of the TYGON.

Another factor to remember in the use of TYGON with alcohols involves its use with tinctures. Occasionally, the color of the material in solution is imparted to the TYGON. Once again, however, the protectability and functioning of the TYGON is unaffected excepting where solution visibility is important.

TYGON as calendered or press-polished sheeting is used primarily to line and cover all types of process equipment. It also is die-cut into gaskets, seals, and separators for a wide variety of uses.

In molded form, TYGON has even wider application—a range of uses limited only by the size and shape that can be imparted to a thermoplastic material by mold and press.

In the form of extrusions, TYGON's major use is as flexible tubing and piping. In both plant and laboratory, strong, light, glass-clear, and fully flexible TYGON Tubing has done much to simplify the problem of transmitting corrosive liquids, gases, or semi-solids. Extruded solid cord and channel also find use as gasketing, expansion jointing, and packing.

As a paint, TYGON is used to protect equipment, structural steel, walls, and ceilings against corrosive fumes and spillage. As a plastisol, TYGON is used as a heavier duty coating and in the casting or "slush" molding of flexible parts and fittings.

For most applications, TYGON in its various forms is a very practical material for use with alcohols and mixtures of alcohols with other chemicals. Occasionally, limits may be imposed by the added chemicals or by the need for absolute purity. However, these are isolated cases. TYGON can be safely regarded as an economical and effective material of construction, medium of transmission and protective coating for use with alcohols.



*In addition to TYGON in its various forms, we also manufacture a number of other materials capable of handling alcohols and their mixtures with other chemicals in any concentration and under all types of operating conditions. These products include chemical stoneware and porcelain, acid proof brick and cements, homogenous lead linings, and other organic linings and coatings.*

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ENGINEERS, MANUFACTURERS, ERECTORS OF CORROSION-RESISTANT EQUIPMENT SINCE 1865

# THE Chemementator

Reg. U. S. Pat. Off.

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

## Total synthesis of cortisone

A team of Merck chemists headed by Dr. Lewis H. Sarett, whose synthesis of cortisone from ox bile in 1946 sired the first commercial process for its production, has now achieved a total synthesis of cortisone.

The new synthesis has advantages over two other methods for total synthesis of cortisone worked out last year at Harvard and Oxford. It's much simpler, requiring only 30 steps to build the four-ring steroid from ethoxypentadiene and benzoquinone. And it neatly sidesteps the troublesome introduction of the essential oxygen at the 11-position of the steroid nucleus. Instead, an oxygen in one of the starting materials, benzoquinone, is kept throughout the synthesis, finally winding up in exactly the right place as the oxygen in the keto group at the 11-position in cortisone. Dehydrocorticosterone and 11-ketoprogesterone are likewise synthesized as part of the new Merck process.

While partial synthesis involves modifying the structure of a steroid like ergosterol from yeast or diosgenin from Mexican yams, total synthesis is a far more difficult job. The entire four-ring steroid nucleus has to be built up.

A simple four-ring system could, at least theoretically, exist in 64 different forms. Hence the difficulties encountered in synthesizing cortisone from a one-ring compound like benzoquinone. At each stage, Merck chemists had to work out stereospecific reactions to get the isomer that alone could be profitably used in the next step.

Production of cortisone from ox bile will continue, at least for the present. And the new total synthesis by Merck won't rival the Upjohn fermentation process in immediate commercial significance. However, the new process, which Merck will further develop, points to eventual production from abundant coal-tar benzoquinone of cheap synthetic cortisone.

## Up titanium

DPA has boosted the titanium expansion goal from 10,000 tons a year by 1955 to 22,000 tons. This new goal will push titanium development as far in five years as aluminum went in 50 years.

The Defense Materials Procurement Agency's present contracts with Du Pont and Titanium Metals Corp. of America call for annual output of 7,200 tons in 1954. DMPA is negotiating with at least two other titanium producers, now only in pilot-plant operation,

to get them into commercial production. Among the likely prospects: Kennecott Copper, Union Carbide & Carbon, Dow Chemical and Monsanto.

DMPA's inducements: guaranteed markets, fast tax writeoffs, cash advances with option of repayment in titanium metal, and cancellation of indebtedness if the current magnesium reduction process becomes obsolete during life of the contract.

Principal source for titanium is rutile, for which DPA has set a separate expansion goal. The goal calls for the U.S. to be getting 25,000 tons a year of rutile from this country and abroad before the end of 1954. This will mean about 6,000 tons of new capacity over 1951.

About two-thirds of the current U.S. supply of rutile is imported from Australia. One-third is produced here. DPA expects most of the rutile expansion to take place in Florida, where beneficiation plants are planned to extract the reddish brown mineral from sand.

Meanwhile, efforts are being intensified to get titanium from minerals other than rutile. An increasingly important source for titanium is ilmenite, more plentiful than rutile. However, at present the process of extracting titanium from ilmenite is more difficult than the method for getting it from rutile. California, Florida, New York, North Carolina and Virginia all produce ilmenite. Less expensive methods are being sought to get titanium from both rutile and ilmenite. Titanium occurs in other minerals, being the ninth most abundant element in the earth's crust, but it is difficult and costly to extract, and few deposits are large enough to have economic importance.

## New process yields more reactive calcium

Ethyl Corp. is now recovering a highly reactive form of calcium metal by a new process from the sludge coming from electrolytic sodium production at Baton Rouge. A marketable sodium alcoholate is produced simultaneously. Present output is from a pilot plant at Baton Rouge. Commercial production there will be decided upon sometime next year, it's believed, when the current market development is completed.

Ethyl produces calcium as a free-flowing crystalline powder, easy to handle and with greatly increased reactivity. It ranges in particle size from 50 to 400 mesh and has a bulk density of about 43 lb. per cu. ft. Its chemical purity is 94 to 97 percent. It is essentially free

(Continued on page 108)

## THE CHEMENTATOR, continued

of nitride nitrogen (typically 15 ppm.), heavy metals and other impurities. This is important in metal oxide reduction, where it makes possible production of pure ductile metals.

In its new process, Ethyl treats the sludge with an alcohol that reacts preferentially with the sodium, evolving hydrogen and forming a sodium alcoholate, which dissolves. The undissolved calcium metal settles to the bottom, and is separated before it begins to react with the alcohol.

With anhydrous alcohols, the process must be carried out at low temperatures and the calcium removed quickly before it reacts. But with water present, the process can be carried out at reflux temperatures, eliminating the need for costly refrigeration equipment.

In a modification of the process, calcium is recovered from the sludge and a higher alcohol is simultaneously produced from a lower one. The sludge is treated with a lower alcohol and an ester of a fatty acid corresponding to the desired higher alcohol, preferably under anhydrous conditions and in the presence of an inert organic solvent.

Ethyl is banking heavily on the high-temperature reduction of the refractory oxides of such metals as uranium, titanium, zirconium, vanadium, thorium and chromium as the biggest potential market for its calcium metal. Other likely markets: for alloying with aluminum, magnesium, tin, zinc and nickel; for deoxidizing and desulphurizing steels and other alloys; and as a reducing, condensing or polymerizing agent in organic reactions. Ethyl will introduce its new finely divided calcium metal at \$1.50 per lb., compared with a present price of \$2.05 a lb. for the massive metal.

### Atomic power plant for Nevada?

Nevada hopes to locate the world's first commercial atomic power plant at Richmond Eureka mine, where it would supply cheap power for extraction of gold, silver, lead and zinc ores. The proposal is now before the Atomic Energy Commission.

### Burning waste gases pays off now

**PROFITABLE CATALYST**—A new oxidizing catalyst is ultimately expected to save U.S. industry hundreds of millions of dollars a year. Eugene J. Houdry, pioneer in catalyst research and now president of Oxy-Catalyst, Inc., which he organized, developed the new oxidation catalyst, basically of catalytic alumina and platinum alloy. Long-lived and almost incredibly active, the catalyst makes it profitable to burn wastes that once polluted the atmosphere, getting useful heat from them.

In the refining industry alone, use of the catalyst could mean a yearly return of at least \$8 million. A partial installation at the Marcus Hook, Pa., refinery

of Sun Oil Co. is already saving the company \$27,500 a year—more than enough to pay for itself. When the installation is completed it will return more than \$80,000 yearly. Extensive further use of the catalyst at Marcus Hook and at Sun's Toledo refinery is expected to raise the company's savings to \$500,000 annually.

**DIVERSE INDUSTRIES**—Savings in the refining industry, while important, are but a trickle compared with those foreseen by Houdry for all the country's industry. First industrial success of the catalyst came in metal coating. Installing the Houdry catalyst last spring, Enamelstrip Corp. of Allentown, Pa., cut its fuel bill 90 percent and solved a nasty air pollution problem at the same time. Instead of being vented to the atmosphere, solvent fumes are converted into heat that is used to bake enamel on metals in a continuous operation.

Oxy-Catalyst, now busily turning out the oxidizing catalyst at Wayne, Pa., is working with firms in 45 different industries on problems of air pollution and waste conversion. Among them: paint and varnish, food, asphalt, textiles, rubber and chemicals.

**BURNING REFINERY WASTES**—In the oil industry, the new oxidation catalyst makes it practical to recover the heat of combustion from carbon monoxide and hydrocarbons contained in the regeneration flue gases from fixed and moving bed catalytic cracking units. Carbon monoxide can be burned completely at little higher than the theoretical oxygen concentration. Combustion can be started at inlet temperatures as low as 400 to 500 deg. F., and in the upper range of carbon monoxide concentration, about 6 percent by volume, the catalyst can stand final temperatures as high as 1,800 deg. F. Heat recovery alone makes burning of the waste gases economically attractive.

**SUN'S FIRST INSTALLATION**—For the first commercial trial of the waste burning catalyst, Sun revamped one of the Houdry fixed bed units at its Marcus Hook refinery. Two huge auxiliary reactors, each over 10 ft. in diameter and 25 ft. high, had previously been built on this cracking unit.

One of these auxiliary oxidation reactors was emptied of the pelleted copper oxide catalyst that had been tried earlier. The perforated distributing tubes for air were torn out. Only the finned tubes for circulating molten salt were left in the reactor. A stainless steel grid support was put in on top of these cooling tubes and the new Houdry catalytic units simply stacked in five layers of 500 each on the grid. Instead of taking up all 25 ft. of the reactor as the pellets did, the catalytic units occupy only the top 15 in. and are easily accessible.

**CATALYST UNITS**—Each of these Houdry oxidizing catalyst units consists of 73 porcelain rods, about 6 in. long, coated with a 0.003-in. film of catalytic alumina and platinum alloy, and held in staggered rows between porcelain end plates 3 in. square. Gases flow across the rods, each of tear drop cross section to mini-

(Continued on page 112)



# Inject { ADDITIVES INHIBITORS DYES SLURRIES GELLING AGENTS } Automatically

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**%PROPORTIONEERS, INC.%** standard Chem-O-Feeder is particularly adapted to continuous feeding of the "hard-to-handle" reagents and additives. It can be supplied with special heads as illustrated—also special materials - handling heads to accommodate an almost infinite variety of chemical characteristics.

The Chem-O-Feeder is being widely used in the production of foam rubber, the chemical preparation of metal surfaces prior to spray painting, the handling of filter aid slurries in oil recovery operations, and the feeding of dyes in the textile industry. This versatile feeder also has applications in many other industries where difficult, small quantity feeding and proportioning problems are encountered.

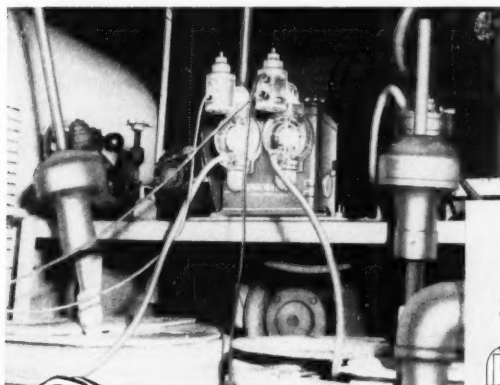
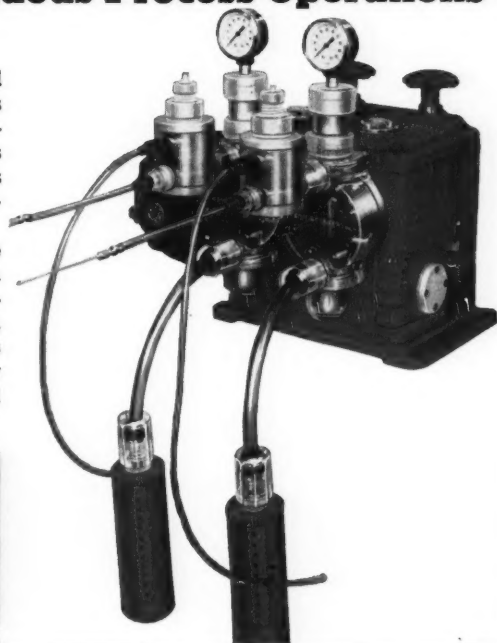
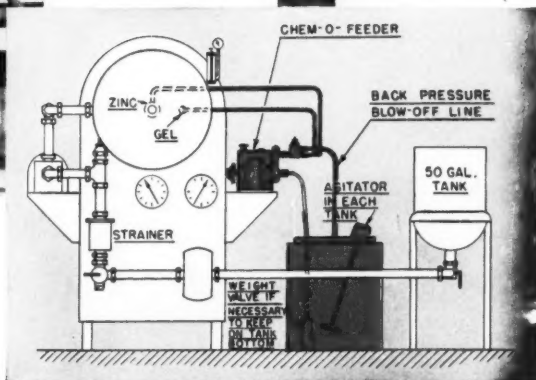


Photo courtesy The Faultless Rubber Co., Ashland, Ohio.



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Installation of Model 2-47 Chem-O-Feeder for foam rubber production.

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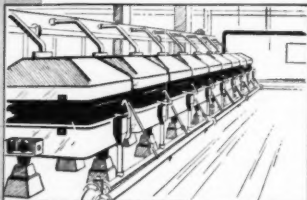
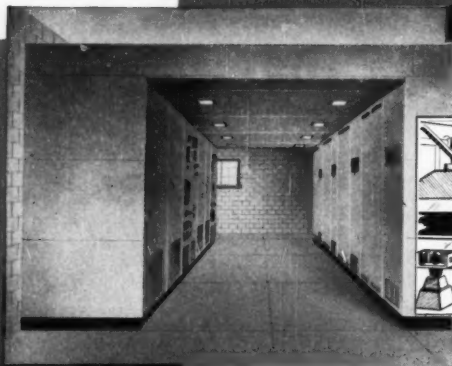


**PROVED BY 33 INSTALLATIONS**

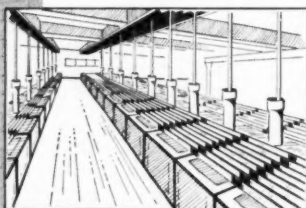
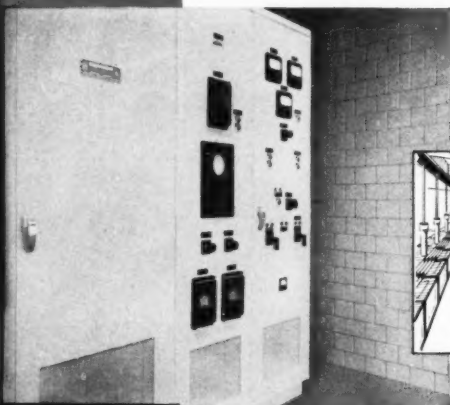


# MECHANICAL RECTIFIER

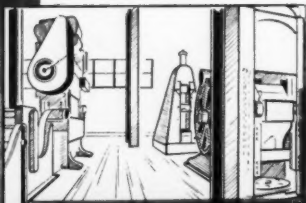
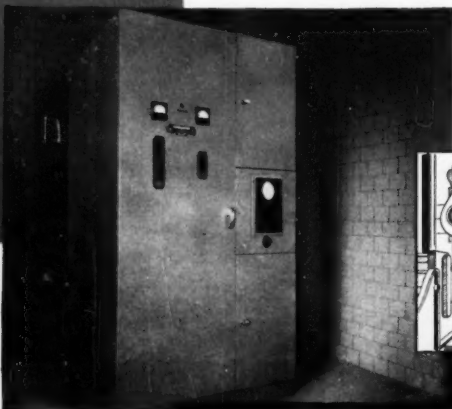
## TYPICAL HEAVY-DUTY D-C APPLICATIONS



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- HIGH AVAILABILITY
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- LOW INSTALLATION COST
- RUGGED TRANSFORMERS
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- SIMPLE VOLTAGE CONTROL

## CAPACITY RANGE

Standard ratings for unit installations: 3000, 4000, 5000, 6000, 7000, 8000, 9000, and 10,000 amperes.

Additional capacity obtained by paralleling units of suitable ratings.

Output voltage: any voltage from 50 to 400 volts d-c.

Common primary voltages: 2300, 4160, and 13,800 volts—3-phase, 60 cycle, a-c.

# gives highest efficiency...

## 96%—and higher—from a-c line to d-c bus

Take the most efficient *method* for converting a-c to d-c—by mechanical switching. Then design *equipment* to get the highest efficiency obtainable with this method. The result is almost ideal rectification.

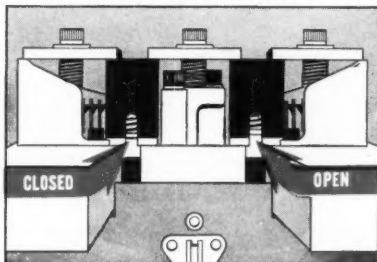
That's precisely what I-T-E engineers have done to bring you the most advanced, efficient, dependable means for converting a-c to d-c in the world today—the I-T-E Mechanical Rectifier.

The record of 33 outstanding installations to date—120,000 amperes of connected load—speaks for itself!

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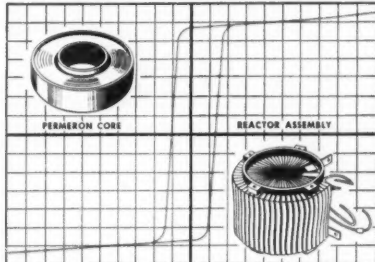
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—held closed by powerful spring, give highest conductivity between a-c and d-c networks. 6 pairs of contacts make up basic contact system—one positive and one negative for each phase of 3-phase a-c supply.

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A Permeron® saturable-core reactor—between a-c supply and contact mechanism—provides a brief period during which current in a contact is zero! Time sufficient for sparkless contact opening is gained.

*\*I-T-E's special saturable core material. Typical Permeron magnetization curve is shown above.*

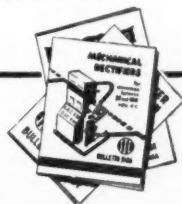
From a-c line to d-c bus, equipment is designed to hold all losses to a minimum. The I-T-E Mechanical Rectifier serves with 96% efficiency and higher—in the voltage range

between 50 v. and 400 v.—on continuous heavy-current processes. As a result, you can count on big savings—get more d-c from the power you buy.

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- Bulletin 5106—covers simple theory, space requirements, and standard arrangements.
- Bulletin 5204—gives details of I-T-E's special magnetic core material, "Permeron."
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EPD Canadian Manufacturing and Sales: Eastern Power Devices, Ltd., Toronto

## **THE CHEMENTATOR, continued**

mize turbulence. Combustion occurs at the surface of the catalyst rods. Pressure drop is negligible.

**WHAT HAPPENS**—Waste carbon monoxide and hydrocarbons, blown out of the oil cracking reactor at Marcus Hook in a continuous stream, are burned as they pass through the catalyst. Most of the heat is converted to steam and the rest, through a gas turbine, to electric power.

Flue gas, containing about 3 percent carbon monoxide, enters the oxidation reactor at 775 deg. F. About two-thirds of the carbon monoxide is converted to carbon dioxide, with the production of 7,500,000 Btu. per hr. Temperature just after leaving the catalytic elements reaches 1,075 deg. F. Most of the heat generated is carried off by the molten salt circulating in the pick-up tubes. This cools the flue gas to 825 deg. F.

**HEAT FOR STEAM AND POWER**—Thus 80 percent of the heat liberated, or 6,000,000 Btu. per hr., is converted to high-pressure steam in the salt boiler that is part of the cracking unit. The rest of the heat increases the temperature of the flue gas driving a gas turbine, resulting in additional production of about 80 kw. This turbine, in turn, drives a compressor that forces 40,000 cfm. of air at 50 psi. through the cracking unit to regenerate the cracking catalysts.

The single unit has been operating continuously for five months. When the second reactor on the cracking unit at Marcus Hook is equipped with the new catalysts, the present heat saving of 7,500,000 Btu. per hr. is expected to be tripled.

**ENTICING PROFITS**—So far, the oxidizing catalysts have shown no sign of losing their activity. Initial investment cost of catalyst is about \$25,000 and the replacement cost \$7,500, making the proposition attractive. Yearly savings in fuel alone on the single installation come to \$27,500.

This first installation at Sun's refinery is on a fixed bed cracking unit. On moving bed units, where the carbon monoxide concentration is higher, the economics are still more enticing. For a typical moving catalyst unit, equipped with a 20,000-cfm. air blower and furnishing hot flue gases containing 5 percent carbon monoxide, the heat recovered from combustion plus subcooling of the gases would come to about 25,000,000 Btu. per hr., or a saving of \$85,000 to \$90,000 per year on fuel cost alone.

**COST BREAKDOWN**—Cost of the single installation on the fixed catalyst cracking unit at Marcus Hook isn't typical because revamped equipment was used and the cost was virtually limited to that of the catalyst itself—\$25,000. More representative are estimates that Oxy-Catalyst has made on a proposed complete installation for a moving bed Houdrflow unit at a large eastern refinery.

Total cost there would be \$107,000. Here's how this breaks down: \$30,000 for boiler unit, \$2,500 for

revamping steam drum, \$5,000 for catalyst chamber, \$5,000 for piping, \$5,000 for supports, \$30,000 for erection and \$30,000 for the catalyst.

Annual saving there, predicts Houdry, anticipating recovery of about 20,600,000 Btu. per hr., will equal \$120,000 worth of steam a year.

**PROSPECT**—Houdry's oxidizing catalyst can be used profitably in many industrial processes. It is highly efficient in burning wastes that might otherwise pollute the atmosphere. It can be used wherever gases are burned to get heat—and that means in just about all of the chemical process industries.

## **Pine-rich Dixie looks to cellulose**

Production of chemical cellulose from southern pine is helping to underpin the South's new era of prosperity. Rayonier Inc. is building a \$25 million chemical cellulose plant at Jesup, Ga., its fifth plant in that new southern boom town.

Chemical cellulose from wood, first produced in the '20s for the rayon industry, is one of the most significant achievements of industrial chemistry in this century, according to President Clyde B. Morgan of Rayonier, who foresees an even more important role for cellulose in the future.

"In 1951," says Morgan proudly, "our industry produced 19 million cubic feet of chemical cellulose, which is greater than the total U.S. volume production of all the non-ferrous metals combined, and our production capacity is steadily increasing." Rayonier currently accounts for about 60 percent of U.S. chemical cellulose production.

Pressure of population, expected to approach 190 million in 25 years, is creating "a heavier demand for cellulose in all its many forms," according to Morgan.

In only 15 years, chemical research has made the fast-growing southern pine, once of little economic importance, a profitable source of chemical cellulose. Continuing research will uncover other new and equally important uses for the southern pine. Currently, Rayonier is pushing its research efforts with wood, and Morgan hints that it will soon disclose a new non-cellulosic product.

## **Makers of chemical machinery to expand**

For manufacturers of machinery used in producing chemicals, DPA has set a target of \$11 million capital investment in added production capacity to be completed by January 1954. The \$11 million represents the increase over capacity at the beginning of 1951. The expansion is limited to machinery for producing chemicals and does not include machinery for making products in which chemicals are used. About half of the goal has been covered by fast tax writeoffs.

Another expansion called for by DPA will require a capital investment of \$50 million to add manufacturing capacity for industrial valves and fittings. To be  
(Continued on page 114)

# WHAT FORM

**Anhydrous  
Commercial  
Fuming  
Reagent**

# of NITRIC ACID

## Do You Use ?

### GENERAL CHEMICAL Has Them **(All!)**

*...in all grades...all strengths*

**NEED NITRIC ACID** for pickling stainless steel . . . or for surface treating of magnesium and aluminum? Perhaps you use it for etching and engraving, for making explosives, or for aircraft and rocket propulsion! Whatever form of Nitric Acid you use—General Chemical can supply your needs.



**AS A PRIMARY PRODUCER** of Nitric Acid for 53 years, General has delved deeply into the product's properties and potentialities. This knowledge led to General's development of the first anhydrous Nitric Acid ever produced commercially, as well as to production of special fuming forms for urgent defense programs.

Today, General Chemical is industry's sole source, producing all forms of this essential acid . . . in any desired grade or strength . . . for any need.

For your Nitric requirements, consult General Chemical. Further information on any of the grades and strengths listed here may be obtained from the nearest General Chemical office serving you.

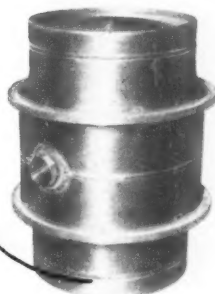
### GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo  
Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston  
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In Wisconsin: General Chemical Company, Inc., Milwaukee

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



#### Grades of General Chemical Nitric Acid include:

##### ANHYDROUS

Total acidity 99.8% min.

##### COMMERCIAL

Standard—36°, 38°, 40°, and  
42° Baume

Diamond (highest commercial  
quality)—36°, 38°, 40°, and  
42° Baume

95% (48.5° Be) Diamond and  
Standard

Photo Engravers—36°, 38°,  
40°, and 42° Baume

##### FUMING

Fuming Red-Technical and  
Reagent, Sp. Gr. 1.59-1.60

Fuming White-Technical and  
Reagent, A.C.S.  
Sp. Gr. 1.49-1.50

##### REAGENT

Reagent, A.C.S., Sp. Gr. 1.42

### **THE CHEMENTATOR, continued**

completed by mid-1955, the expansion represents the increase over capacity in October 1950. About 80 percent of the goal has been covered by fast tax writeoffs or applications for writeoffs. Main shortages: cast steel and forged valves of large sizes, turbine valves and large butterfly valves.

#### **From a fluid bed, ethylene oxide**

A new fluidized bed process for the commercial production of ethylene oxide by direct oxidation of ethylene with air has been jointly developed by Atlantic Refining Co. and Vulcan Engineering Division of Vulcan Copper & Supply Co.

In the fluidized bed, a rapidly moving gas stream passes through an agitated suspension of a fine solid catalyst. This contrasts with fixed bed processes that employ large particles of catalyst, the particles not being agitated and mixed by the gases.

In the fluidized bed, agitation keeps temperature uniform throughout the catalyst bed and prevents the formation of hot spots. Big advantages of the new process: (1) better temperature control in the all important reactor; and (2) uniformly high yields of ethylene oxide at economic operating conditions.

Atlantic Refining in Philadelphia first developed the unique fluidized catalyst used in the process. Then Vulcan agreed to take over the process and develop it further. In return, Vulcan gets exclusive rights to design and build commercial plants.

For the past year, Vulcan has operated a large integrated pilot plant in Cincinnati, with results pointing to an efficient and economical process for the production of ethylene oxide. Vulcan is now completing designs and estimates of initial investment and operating costs for commercial plants of various sizes that will use the new fluidized bed process.

#### **California's phenol plant derby**

The race to see who will have the first phenol plant on the West Coast grows hotter. Construction starts early next year on a \$4 million phenol plant at Richmond, Calif., for Standard of California. Standard's El Segundo refinery will be the site for a cumene plant slated to supply the Richmond phenol plant.

Monsanto, the other contender, has already started construction of its phenol plant at Avon, Calif., just up the bay from Richmond. Both plants are expected to be on stream by the end of 1953, so it will be a race right down to the wire.

#### **More chemical pulp plants rising**

New plants to produce chemical pulp are springing up one after another. This chemical pulp goes into plastics, film, cellophane and rayon.

Procter & Gamble is constructing a plant in Florida. Celanese has its second one under way in Canada, and

American Viscose is partner in an Alaskan venture. Older producers like Rayonier and International Paper are also expanding capacity.

Some \$200 million will be spent to boost output 400,000 tons higher than last year's 1,023,000 tons.

#### **Ceramics for rockets**

As the U.S. whooshes into the rocket era, ceramics suddenly take on a new significance. They're needed for rocket nozzles and rocket chamber liners. Norton Co. of Worcester, Mass., for example, has launched a whole flight of new ceramics for use in rockets.

These include silicon carbide bonded with silicon nitride, graphite coated with silicon carbide, refractory carbides, borides and nitrides, oxide coatings, fused stabilized zirconia, bonded silicon carbide, fused magnesium oxide and fused aluminum oxide.

Silicon carbide bonded with silicon nitride looks like a good bet for rocket nozzles and liners. It resists erosion, withstands thermal shock and has good oxidation resistance. Strong and of low density (apparent density: 2.6 g. per cc.), it has low thermal conductivity compared with graphite or metals. And it can be made in many shapes and sizes.

Graphite alone is useful in rocket nozzles and liners because of its light weight and high resistance to thermal shock. However, in many uses it is eroded too rapidly. Coating the graphite with a thin layer of silicon carbide formed at high temperature increases the erosion resistance of the graphite. Norton can manufacture these coated graphite nozzles in a variety of shapes and in sizes up to 28 in. in diameter.

Norton also produces refractory carbides, borides and nitrides, such as zirconium boride and titanium boride, for rocket nozzle inserts. They have extremely high melting points, are strong and resist erosion.

Recently, Norton has developed highly refractory crystalline coatings. These adherent coatings of such oxides as stabilized zirconia or aluminum oxide are formed on the surface of graphite or metals such as steel and aluminum. They protect the base material and insulate it thermally for short periods.

Other Norton ceramics for rocket nozzles and rocket chamber liners are fused stabilized zirconia, bonded silicon carbide, fused magnesium oxide and fused aluminum oxide.

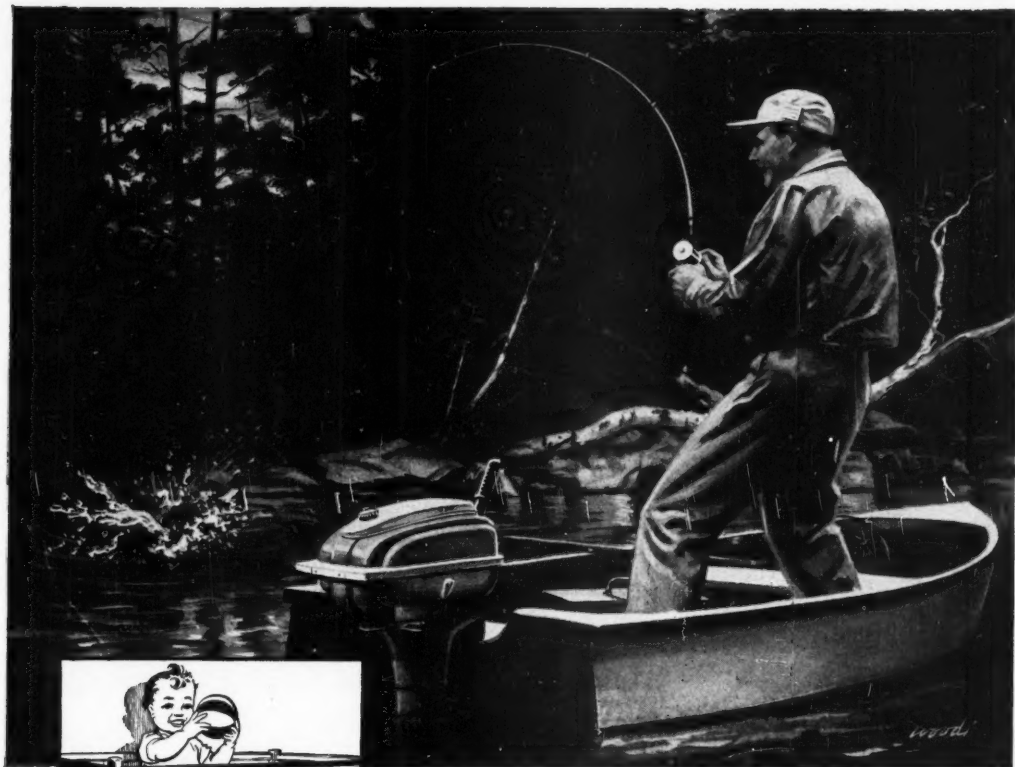
#### **New process industries for Alaska**

Alaskan industry is looking up. Besides the \$400 to \$700 million plant Aluminum Co. of America has proposed at Skagway, a \$45 million pulpwood plant will be built at Ketchikan by the Ketchikan Pulp Co. and a \$1.2 million plywood plant at Juneau by the Juneau Plywood Co.

Alaska's forest reserves, according to the Interior Department, could supply 25 percent of the nation's newsprint.

—End





## Plastics at Play

On a placid pool or in a playpen . . . boys of all ages appreciate plastics. Take a look at our angler . . . plastics play an important part in his boat, motor, tackle box, waterproof jacket — and even the wily wall-eye goes for a colorful plastic plug. Today, more and more things are made easily, economically and expertly in plastic. This versatility is due in part to remarkable new resins and plasticizers, applicable to countless products, developed through chemistry.

Contributing to the development of the progressive plastics industry, Mathieson now supplies more basic chemicals than ever before . . . such essential raw materials as: caustic soda,

liquid chlorine, ammonia, ethylene oxide, ethylene glycol, diethylene glycol, triethylene glycol, ethylene dichloride and formaldehyde.

Under current market conditions, a dependable source of supply is especially important. If your production requires any of these chemicals, you may be able to buy to better advantage by consulting with us now.

**Mathieson**  
CHEMICALS

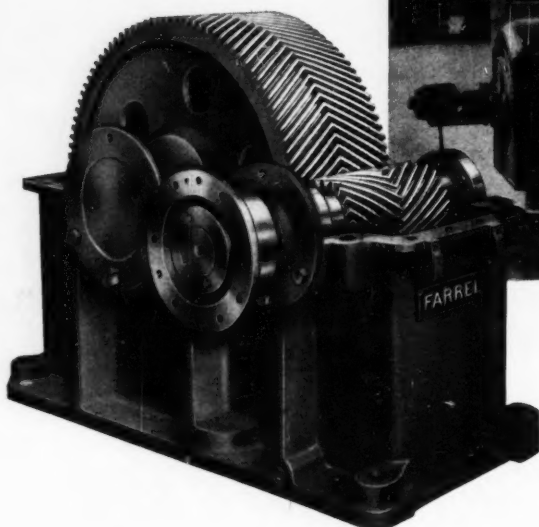
MATHIESON CHEMICAL CORPORATION • BALTIMORE 3, MARYLAND

CHEMICAL ENGINEERING—November 1952

9518

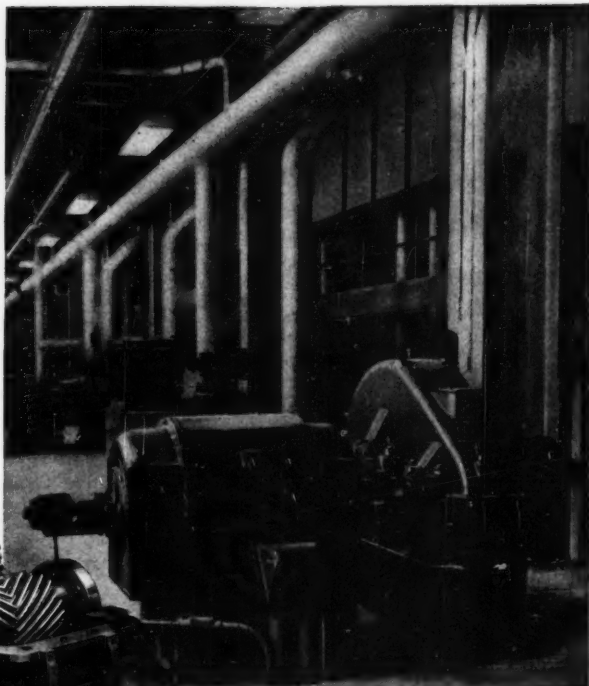
115

# Inside Story of 18 speed reducers in a southern paper mill



The successful performance of Farrel® speed reducers in such mills as this, where eighteen units are installed, is an inside story of design flexibility.

Unlike most "standardized" products, Farrel speed reducers are standard only in their principal features. They are adaptable in critical detail. Gears, shafts, bearings, and even some housing dimensions, can be proportioned to meet specific load, speed and



service requirements. This flexibility has resulted in the solution of innumerable application problems.

In addition to this feature, Farrel speed reducers have a number of other advantages. The quiet, vibration-free performance of the herringbone gears results from extreme accuracy of tooth spacing, contour and helix angle . . . qualities inherent in the Farrel-Sykes method of gear generation. Precision manufacture and highest grade materials contribute to long gear life.

Shafts and bearings are factored to safeguard against interruption of vital processes. Gear cases are proportioned to withstand repeated heavy peak loads. Joints are sealed to prevent entrance of dirt.

*Write for further details of these problem-solving units. Ask for a copy of Bulletin 449.*

## FARREL-BIRMINGHAM COMPANY, INC. ANSONIA, CONNECTICUT

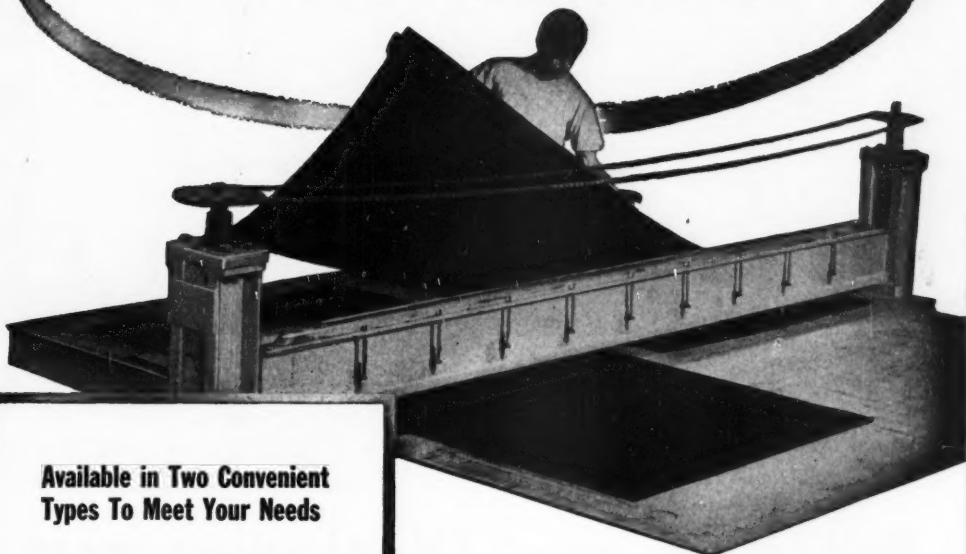
Plants: Ansonia and Derby, Conn., Buffalo, N. Y. Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans.

FB-761

# Farrel-Birmingham®

FOR THOSE EXTREMELY CORROSIVE CONDITIONS...

CONSIDER THE USE OF *Amer-Plate*



**Available in Two Convenient  
Types To Meet Your Needs**

**Plain AMER-PLATE for existing steel  
or concrete tanks or structures**

Plain Amer-Plate is smooth and flat on both sides. It is applied to existing surfaces using specially developed cements that provide a firm bond with those surfaces.



**T-LOCK AMER-PLATE  
for newly cast  
concrete pipe  
and structures**

T-shaped parallel "anchors" are an integral part and extend along the back of each Amer-Plate sheet. The sheet is applied to the inner forms of tanks, concrete pipe, and structures. When the concrete is poured, the tees are embedded and locked into the concrete.



**HERE'S A NEW, EXTRA-TOUGH, ECONOMICAL  
INDUSTRIAL SHEET LINING**

Especially designed to protect against extremely corrosive conditions, Amer-Plate is particularly adaptable for use in highly corrosive sewers, chemical storage tanks, tank cars and tank trucks hauling unusually corrosive solutions.

Composed of inert resins and plasticizers, Amer-Plate is impervious to gases, highly resistant to acids, alkalies, alcohol, oils, salts, and petroleum products. It has a very low moisture vapor transmission rate, will not support combustion, and contains no toxic materials.

Amer-Plate is a flexible thermoplastic sheet, practical for application to flat, curved and angular surfaces. Its economy and effectiveness has been proved in the field in over 10 years of development and testing.

So... wherever you require long lasting protection against extreme corrosion, make a full investigation of the possibility of using Amer-Plate. Write for complete information.

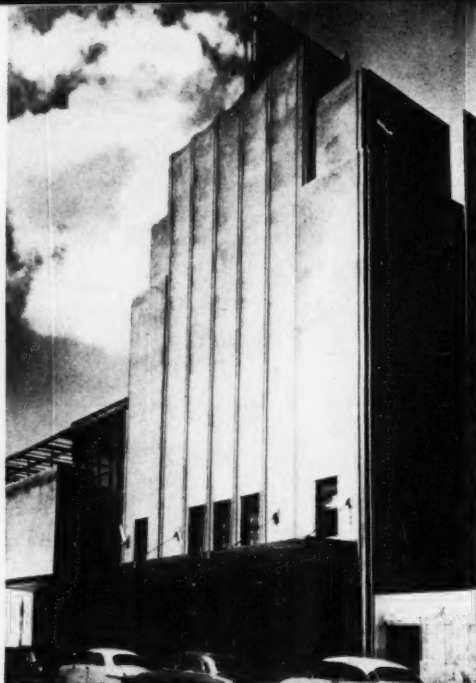
**Amer-Plate industrial sheet lining is the result of many years experience in the manufacture and application of Amercoat protective coatings.**

**AMERCOAT  
CORPORATION**

A division of American Pipe and Construction Co.  
4809 Firestone Blvd., South Gate, California



**TELEVISION POWER BREAKER.** The 500-kva G-E unit substations at WWJ-TV have voltage ratings of 4800-208Y/120, are equipped with Type AK-1-25 air circuit breakers.



**WWJ's NEW BUILDING** houses studios of Detroit's pioneer TV station. General Electric load-center system furnishes power for amplifying, lighting—other station requirements.

# Detroit's new TV studios rely on

## Power continuity assured for all studio requirements at WWJ-TV by secondary-selective distribution system

For the engineers of WWJ-TV—Detroit's pioneer TV station and an affiliate of WWJ, the world's first commercial radio station—a dependable source of continuous power rates first consideration in planning the new television studios. Total or even partial power shutdown cannot be tolerated.

At its new studios, WWJ-TV needs reliable power for lighting and amplifying . . . for its monitor panels and relaying equipment . . . for all station auxiliaries such as fans and blowers. To assure reliable power continuity for these many exacting requirements, Giffels & Vallet, Inc., L. Rossetti, associated engineers and architects, and Jack A. Frost, electrical contractor, installed a G-E secondary-selective load-center system consisting of two 500-kva unit substations.

With this distribution system, the station gains, too, in savings basic to load-center power. For example, a G-E engineered load-center system maintains consistent voltage for top operating efficiency, keeps

voltage drop down to a minimum, provides less costly feeder breakers, and reduces cable costs.

Air circuit breakers, with ratings properly coordinated with transformer capacities, give adequate interrupting capacity and isolate troubles in feeders. Oil fuse cutouts are interlocked to prevent opening with load on transformers.

Flexible layout permits easy, quick maintenance without interruption of power. System flexibility itself provides for addition of new loads, making it far less costly for the station to expand in the future. Grounded, metal-enclosed G-E load-center units, with non-inflammable Pyranol\* transformers assure maximum protection for operating personnel.

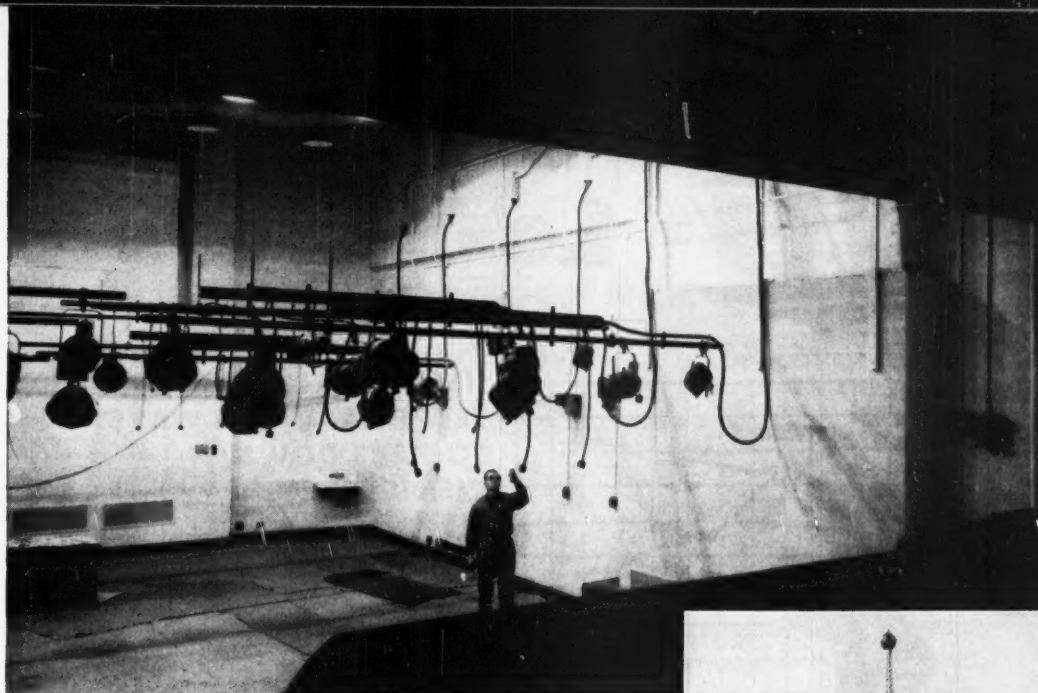
For further information on G-E engineered load centers, call your local G-E sales representative, or write for GEA-3592, General Electric Company, Schenectady 5, N. Y.

\*Reg. Trademark of General Electric Co.

321-47

**GENERAL**  **ELECTRIC**





**LIGHTS FOR TV PRODUCTION.** Studio construction shot from WWJ-TV's control booth shows battery of lights necessary for televising. Lighting throughout the new station is fed from G-E engineered load centers.

## G-E load-center system



**CUTOUTS FOR PROTECTION.** Engineer wires pothead of incoming high-voltage cable to cutouts on transformer of TV lighting breaker. Oil cutouts are interlocked, cannot be opened or closed with load on transformer.

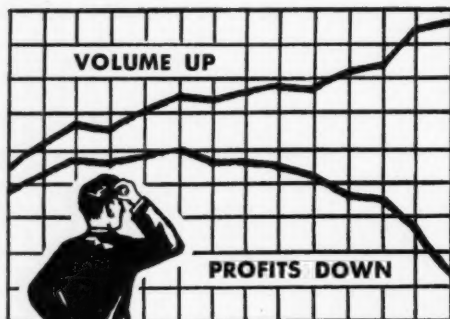
**PENOBSCOT BUILDING**—Detroit's highest—houses all of WWJ-TV's transmitter equipment. TV antenna tops highest central portion. Here are transmitted programs originating in new studios powered by G-E load centers.







# Lo-Veyors



**HERE IS ONE OF YOUR  
FEW REMAINING WAYS  
TO PARE DOWN  
RISING COSTS**



● Materials handling by old-fashioned, man handling methods is an easily overlooked, but expensive item in your non-productive labor column. This is increasingly true under present day operating conditions. Manufacturers are taking advantage of Ajax Lo-Veyors as a source of important economies in handling bulk materials.

Ajax Lo-Veyors provide fast, automatic, trouble-free handling of bulk materials in and outdoors, under abrasive, corrosive, poisonous and explosive laden air.

Write for facts on the advantages of Ajax Vibrating Conveyors.

**AJAX FLEXIBLE COUPLING CO. INC.**

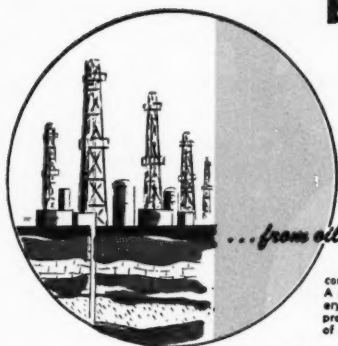
WESTFIELD, NEW YORK

# \$ulfur

**by-product with a big dividend**

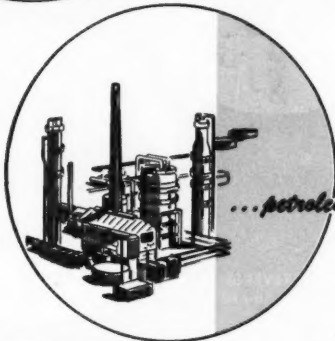
**recovered with**

## **FOSTER WHEELER EQUIPMENT**



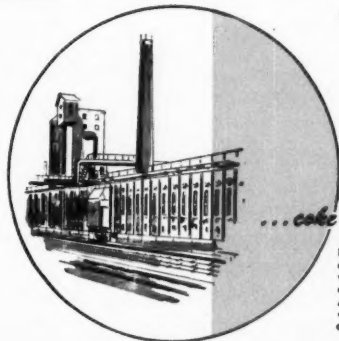
*...from oil and gas fields*

H<sub>2</sub>S content of sour gas converted to elemental sulfur. A Foster Wheeler sulfur recovery plant in one location is producing over 300 tons/day of elemental sulfur.



*...petroleum refineries*

H<sub>2</sub>S gases previously "flared" and the sulfur wasted, now recovered. Two Foster Wheeler sulfur recovery plants for this service now under construction.



*...coke ovens*

Removal of H<sub>2</sub>S from coke oven gas not only enhances the value of the gas but provides a source of elemental sulfur. A Foster Wheeler sulfur recovery plant is in operation on this service.

The unprecedented demand for Sulfur has reached a point where the world's available supply is seriously threatened. Thus, the need to find new sources for this vital element becomes one of the major items on today's agenda for full-scale production for both defense and civilian needs.

Fortunately, there is a great new source. Instead of allowing it to vanish into thin air, Sulfur is being recovered profitably from H<sub>2</sub>S bearing gases with Foster Wheeler equipment. A quarter million tons of Sulfur per year will be recovered by Foster Wheeler plants installed or now under construction.

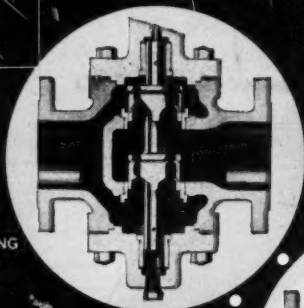
## **FOSTER WHEELER**

**165 BROADWAY, NEW YORK 6, N. Y.**

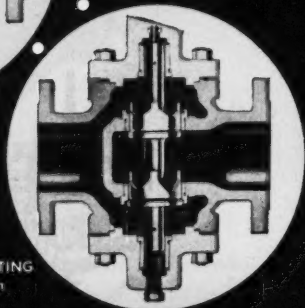


## QUICK SHIFT

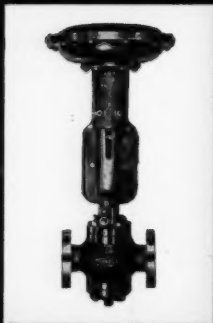
DIRECT ACTING  
air to close



REVERSE ACTING  
air to open



**for easy field reversal of valve action**



You can reverse the control action of the Honeywell Series 700 Valve by inverting the valve body and disc, and turning the travel indicator plate to its reverse side. It can be done in the field . . . easily and quickly, without extra parts or complex adjustments. The Honeywell Series 700 wide band proportional control valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-2.

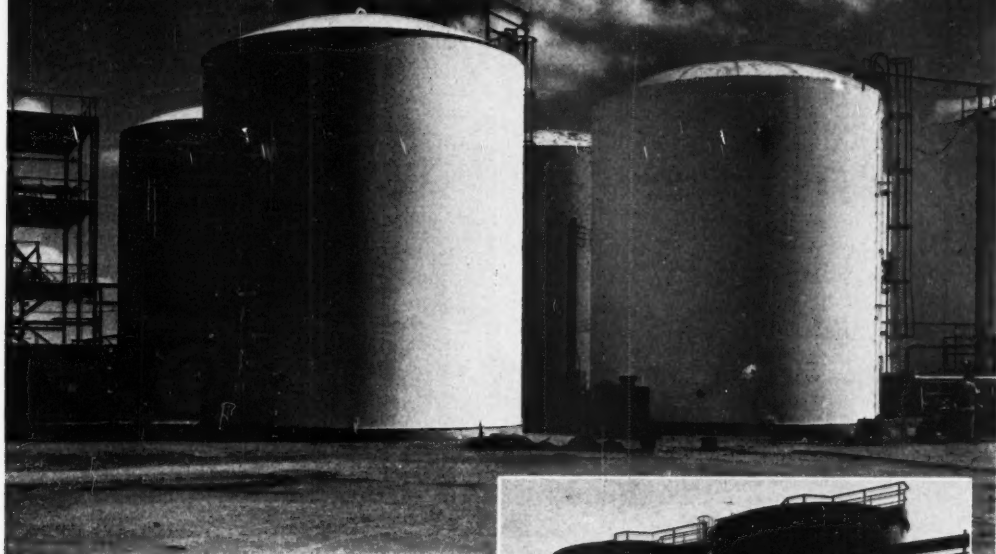
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Avenue, Philadelphia 44, Pa.

MINNEAPOLIS  
**Honeywell**  
VALVE PRODUCTS



*First in Controls*

# HORTON TANKS ARE SPECIALLY DESIGNED FOR SPECIFIC JOBS

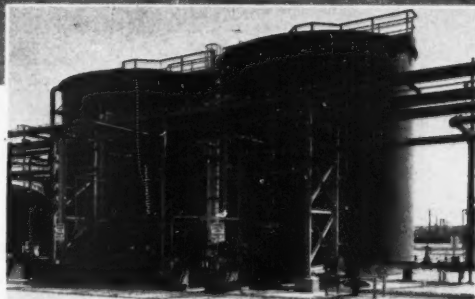


... not that Horton® tanks can't be adapted to different uses . . . they can! But when storing chemicals of a corrosive or volatile nature it is necessary to provide special storage . . . to prevent contamination and evaporation loss.

Chicago Bridge & Iron Company is equipped to fabricate and erect storage tanks and process equipment of lined, stainless clad or solid corrosion-resistant metals. We also build carbon steel plate structures such as flat-bottom tanks, spherical and spheroidal pressure storage tanks, cylindrical pressure vessels and elevated water tanks.

Specialized tank construction and exacting customer specifications offer no obstacles to our experienced design, fabrication and erection departments. Our shops have equipment for stress-relieving and x-raying. We also have facilities to pickle and paint carbon steel by the Horton Phosphoric Acid Process at our Birmingham, Chicago and Greenville, Pa., plants.

When planning installations, write our nearest office for information or quotations. Let our 63 years of experience help you.



*Top: 30-ft. by 30-ft. Horton flat-bottom umbrella roof tanks used to store chlorinated hydrocarbons.*

*Above: Two 30-ft. by 30-ft. Horton flat bottom caustic storage tanks.*

*Below: Three 18-ft. by 11-ft. Horton flat-bottom oil storage tanks.*



®Trade Name Registered in U. S. Patent Office

## CHICAGO BRIDGE & IRON COMPANY

Atlanta 3 . . . . . 2120 Healey Bldg.  
Birmingham 1 . . . . . 1510 North Fifth St.  
Boston 10 . . . . . 1005-201 Devonshire St.  
Chicago 4 . . . . . 2124 McCormick Bldg.  
Cleveland 15 . . . . . 2220 Guildhall Bldg.

Detroit 26 . . . . . 1503 Lafayette Bldg.  
Havana . . . . . 402 Abreu Bldg.  
Houston 2 . . . . . 2103 C&I Life Bldg.  
Los Angeles 17 . . . . . 1505 General Petroleum Bldg.  
New York 6 . . . . . 3318-165 Broadway Bldg.

Philadelphia 3 . . . . . 1625-1700 Walnut St. Bldg.  
San Francisco 4 . . . . . 1522-200 Bush St.  
Seattle 1 . . . . . 1305 Henry Bldg.  
Tulsa 3 . . . . . 1623 Hunt Bldg.  
Washington 6 . . . . . 1160 Calritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

# RIGHT IDEA TO STOP GAS OR LIQUID LEAKAGE!



## Sylphon Packless Valves

Pictured here are four of many types of Sylphon Packless Valves—valves that can help you reduce losses of valuable liquids or gases. Once they are installed on pipe lines carrying oil, gasoline or other volatile liquids or vapors, they prevent even tiniest leaks, in or out.

They do even more to help you. They protect you and your equipment against dangerous leakage—hazardous liquids or gases that can cause fire, explosion or other damage. And, they provide vacuum protection.

Sylphon Packless Valves have no packing to leak or replace. A rugged, Sylphon seamless metal bellows replaces customary packing—eliminates leaks that might seep past the stuffing box of even the best packed type valve. The Sylphon bellows seals the valve stem against corrosive or inflammable liquids or gases.

Many types and sizes in a variety of metals. Widely used in chemical plants, oil refineries, power plants, aboard ships. For complete information, write for Bulletin VC-813.



FIRST WITH BELLOWS

*Temperature Controls • Bellows Devices • Bellows Assemblies*

**FULTON SYLPHON**  
DIVISION

ROBERTSHAW-FULTON CONTROLS CO. KNOXVILLE 4, TENN.

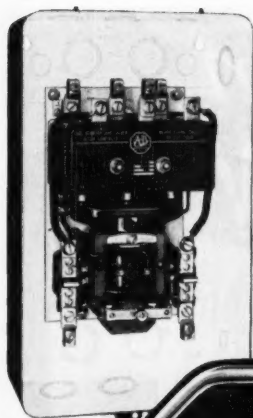
*Canadian Representatives, Darling Brothers, Montreal*



Allen-Bradley Trouble Free Motor Controls for All Industries

## *Safe Motor Control Enclosures*

**FOR EVERY APPLICATION**



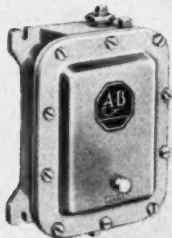
**Watertight  
Nema 4**



**General  
Purpose  
Nema 1**



**Dust-tight  
Nema 9**



**For Hazardous  
Locations  
Nema 7**



**Corrosion-proof  
Nema 11**



**For Hazardous  
Locations  
Nema 8**



**Dust-tight  
Nema 5**

● It pays out . . . in greater production, fewer shutdowns, and in lower maintenance . . . to use the correct enclosure for each motor starter.

Some installations need waterproof or weatherproof enclosures, others require cast-iron cabinets for use in hazardous locations. For particularly corrosive conditions, oil-immersed starters

may be essential. For normal applications, however, the general purpose, pressed steel enclosure with bonderized and baked enamel finish is most popular.

You can always find the right enclosure in the Allen-Bradley line to protect your plant, personnel, and production schedules.

Allen-Bradley Co.

1337 S. First St., Milwaukee 4, Wis.

# **ALLEN-BRADLEY QUALITY MOTOR CONTROLS**

# Baker Platinum Laboratory Ware



Production of platinum laboratory ware has been a specialty of ours for almost three-quarters of a century, and we have devoted a great deal of research and experiment to improving it.

This work has been aided greatly by the fact that we maintain and operate large scientific laboratories and use our own platinum ware in them.

Thus, the ware is subjected to day in, day out tests through use, and practical experience has brought about a number of improvements, among which are:

Improvements in metallurgical processes which have increased its useful life — development of the platinum-rhodium alloy which is now so widely used — design changes like the reinforced rim on crucibles and dishes — development of the low form crucible — improvements in the design of platinum electrodes.

You run no risk in making Baker Platinum Laboratory Ware standard equipment.

**BAKER & CO., INC.**

113 Astor St., Newark 5, N. J.

NEW YORK

SAN FRANCISCO

CHICAGO

# Choose Your Gas Mover from this Wide Range!

## ALLIS-CHALMERS OFFERS 5 TYPES FOR CHEMICAL PROCESSES

**W**HETHER YOUR PROCESS calls for aeration, agitation, circulation, or combustion . . . Allis-Chalmers can meet your particular need from its wide range of air and gas moving equipment.

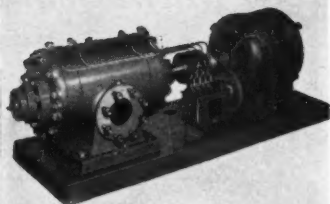
A-C will design to your exact job requirement and will build standard or special, as required. Each of the five types shown can be supplied specifically engineered for corrosive gases . . . for close control of pressure and volume . . . for automatic or manual operation and other variable factors.

*Manufacturer experience?* Allis-Chalmers has been building air and gas moving equipment and their drives for over half a century. *One-manufacturer responsibility?* All the equipment shown on this page is Allis-Chalmers designed and built!

Put this ability to work for you! A-C will build you a completely integrated installation: blower, compressor or pump . . . electric motor or gas or steam turbine drive . . . manual or automatic flow or pressure control. For detailed information or literature on these products, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3876

# ALLIS-CHALMERS



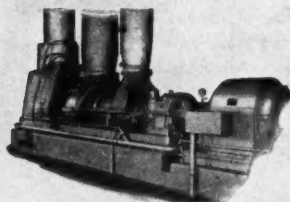
### ROTARY COMPRESSORS

Sliding vane type. Air is compressed in cells formed by blades moving freely in and out of longitudinal slots in eccentric rotor. Quiet, smooth operation. Units inherently start unloaded. Pressures from 5 to 40 psig, volumes to 3300 cfm.



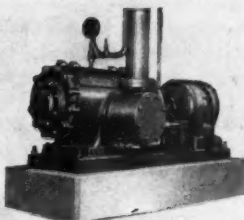
### SINGLE STAGE BLOWERS

Often used for agitation and aeration in fermentation. Discharge nozzle can be arranged in any of 24 positions. Cast casing provides rigid, smooth operation. Available in pressure ranges from 1 to 6.50 lb, volumes to 35,000 cfm.



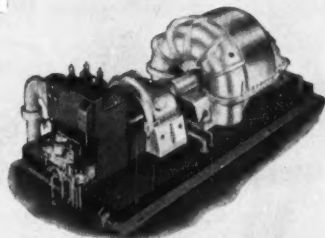
### AXIAL COMPRESSORS

Used in catalytic refining. Handle large fixed volumes of air with pressure variations over a wide range. Good base load machines. Able to compress to 50 lb G with high efficiencies. Units in service to 870,000 cfm.



### DRY VACUUM PUMPS

Same principle as rotary compressors except applied to evacuation. Sliding vane type with no internal valves. Saves floor space. Built in capacities ranging from 10 to 28 in. Hg, 55 to 5750 cfm, 5 to 250 hp.



### MULTI-STAGE BLOWERS

Centrifugal type, for boosting, exhausting, circulating. Cannot build up dangerous pressures. Have enclosed backward-bladed impeller wheels. Pressure volume curve favorable to parallel operation. Capacities to 130,000 cfm.

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In every industry, from chemicals to food to steel, Buell engineers, working with plant engineers, have established an enviable 18-year record of turning unnecessary dust losses into substantial new profits. What's more, Buell Dust Recovery Systems uncover, for all American industry, these additional important advantages: improved product quality, smoother plant-community relations and higher employee morale.

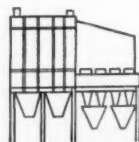
To take advantage of Buell's background and experience in the highly specialized science of dust recovery, ask for further information about Buell's **3 basic systems** of dust collection. See how they can help you turn dust into dollars. Send for Buell's new, informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Buell Engineering Co., Dept. 12-K, 70 Pine Street, New York 5, New York.



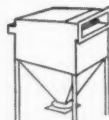
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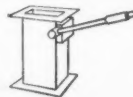
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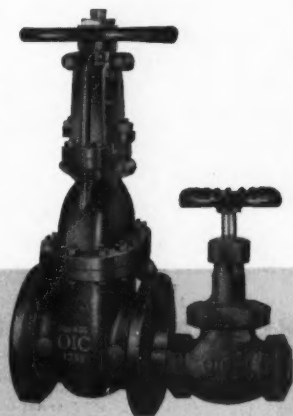
OIC builds valves for every purpose—cast and forged steel, iron and bronze—and every valve is *precision-engineered* and *precision-made* to give longer, trouble-free service at no extra cost to you. OIC offers *precision-application* help in selecting valves best suited to each job.



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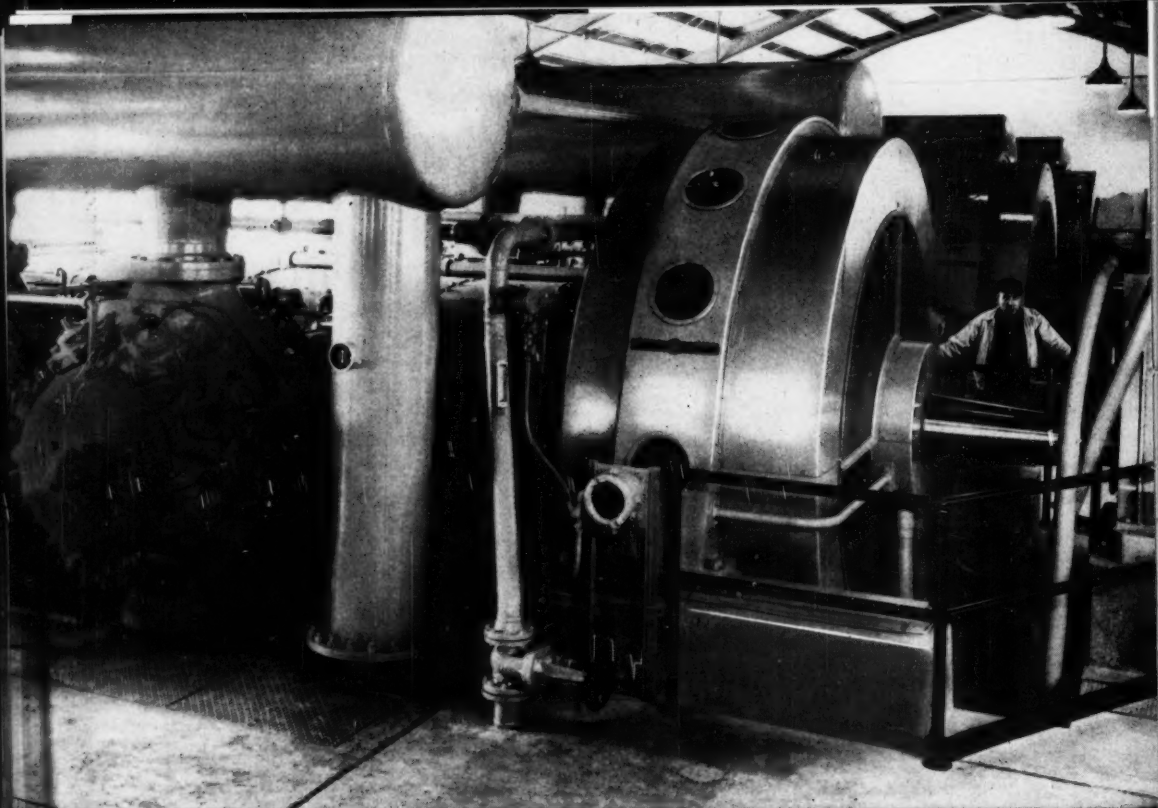
Motor and Texrope Drive available with *AirSet* Mill as a complete engineered unit.

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## ALLIS-CHALMERS

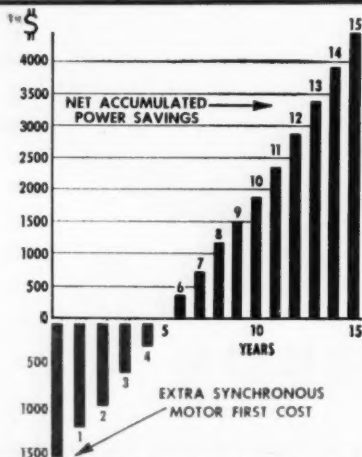


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COMPRESSORS IN A GAS STORAGE STATION are driven by General Electric 3000 hp, 300 rpm synchronous motors.

## Can synchronous motors cut

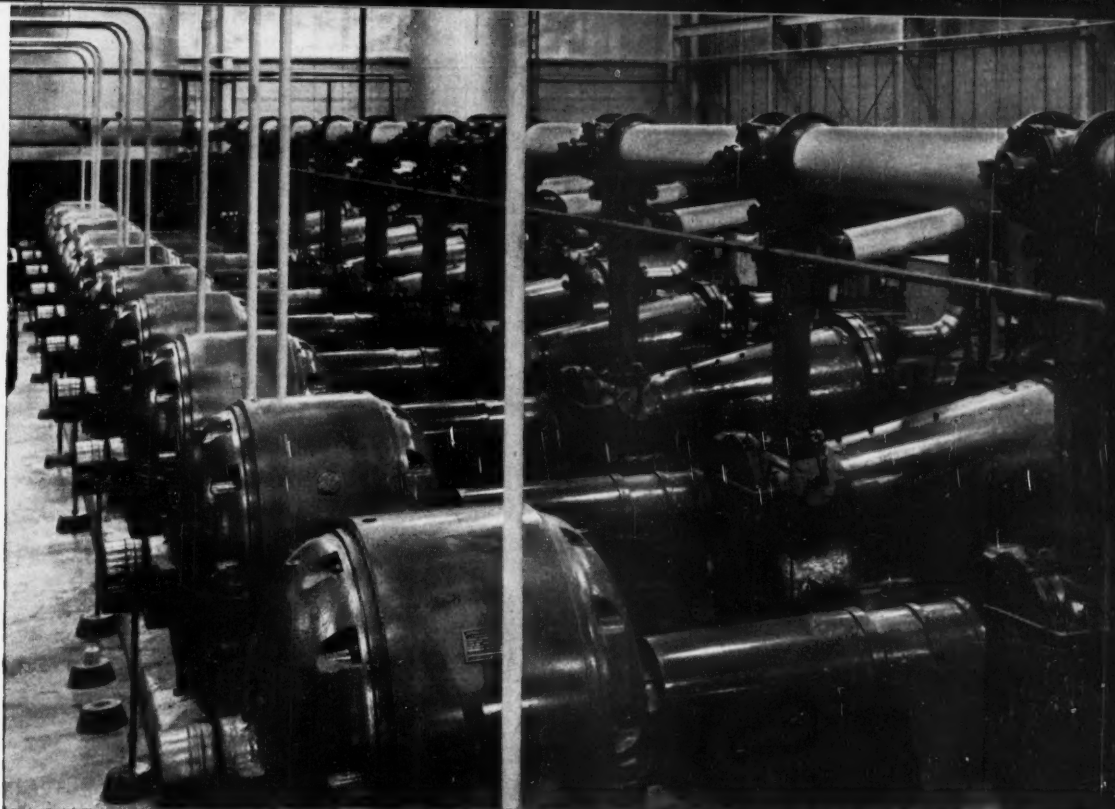


OPERATING SAVINGS on the synchronous motor application described above are shown over a period of twenty years. Extra first cost will be amortized in five years; savings will continue for many more.

### Here's how one plant saves with a G-E Synchronous Motor

The specifications for a new pump motor were 250 hp, 600 rpm, 2300 volts, 3 phase, 60 cycle. The price of a 1.0 Power Factor synchronous motor, including exciter and control, was higher than an equivalent squirrel-cage induction motor with control. However, the synchronous motor efficiency, including exciter loss, was 1.6% higher than the induction motor (93.0% vs 91.4%). Since the motor was to operate continuously at a power cost of 11 mills per kilowatt-hour, it was found that the power savings would repay the additional investment in only five years. The operating savings will continue throughout the life of the motor—10, 20, even 30 years.

Savings such as these make synchronous motors the most economical drive for many heavy-duty, continuous-service applications. And in many cases, synchronous motors are lowest in first cost, too.



GENERAL ELECTRIC 400 HP SYNCHRONOUS MOTORS are coupled to ten Jordans in a paper mill.

# your plant's operating costs?

## Greater Efficiency on Large, Constant-Speed Applications Can Lower Power Costs Substantially

On certain applications selection of General Electric synchronous motors can bring about substantial savings in plant operating costs. Synchronous motors usually have a higher full-load efficiency than any other type of motor, produce more work per dollar's worth of power consumed.

Furthermore, synchronous motors may be able to improve plant power factor—the ratio of total kilowatt load to total kva load. When these two fall out of balance, high system losses, high power bills, or increased maintenance costs commonly result. Using a *unity power factor* synchronous motor adds only to total kw load. And, a *leading power factor* synchronous motor will actually supply reactive kva's to your

system, while operating at its normal rated output.

Before you select a drive for a large piece of equipment providing heavy and continuous service, be sure to investigate the economics of General Electric synchronous motors. Call in your G-E representative—he'll be glad to discuss your situation with you. Also, information on G-E synchronous motors and their application is available in the following bulletins: GEA-5332, "Low-Speed Synchronous Motors;" GEA-5426, "High-Speed Synchronous Motors;" GEA-5817, "Plant Power Factor Improved With G-E Synchronous Motors." Write to Section 770-27, General Electric Company, Schenectady 5, N. Y.

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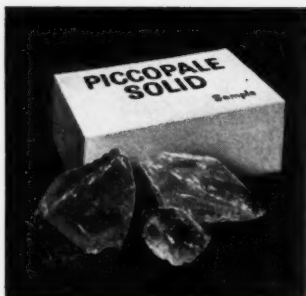


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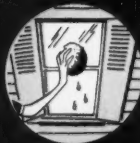
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PICCOPALE offers a new approach to improved quality and lower costs. This brand-new synthetic resin, developed and produced by Pennsylvania Industrial Chemical Corporation provides good chemical resistance, pale

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If you are interested in a bulk material that is absolutely waterproof, that is easy to use with other materials, that is low in cost, high in quality and readily available, investigate PICCOPALE!

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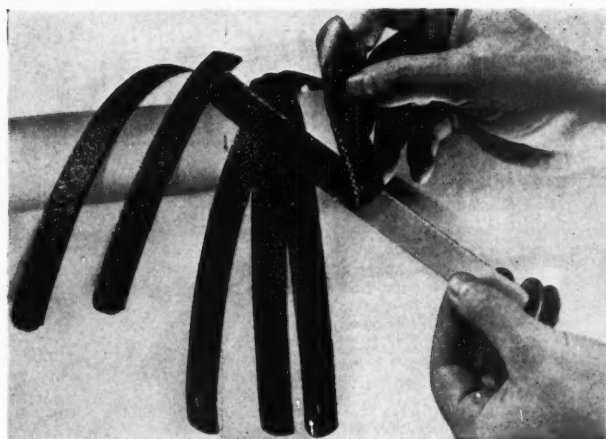


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**IMPORTANT!** VISQUEEN film is all polyethylene, but not all polyethylene is VISQUEEN. VISQUEEN is the only film produced by process of U. S. Patent No. 2461975. Only VISQUEEN has the benefit of research and technical experience of The Visking Corporation, pioneers in the development of pure polyethylene film.





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\*T. M. The Visking Corporation

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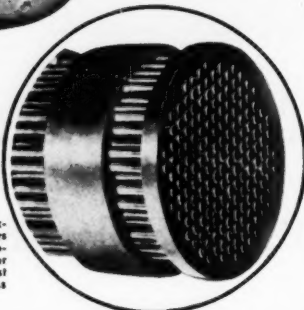
show that **DOWNINGTOWN** can help **YOU**, too



One of 4 Fermenters, 12'0" x 22'7" high tangent, 10% Stainless Clad, type 304 Stainless . . . manhole body and connections type 304 Stainless. Each fermenter equipped with coils of 3" O.D. x 14 ft. tubing . . . type 304 Stainless.

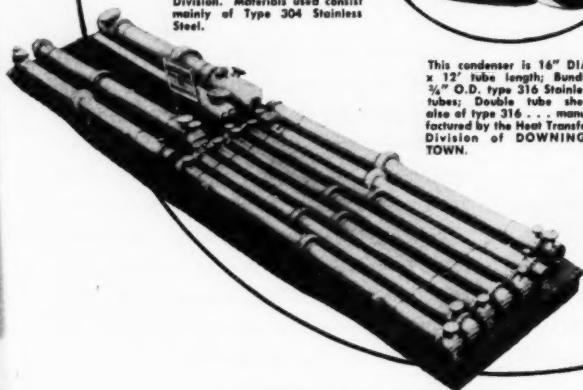


Two of four Steel Shell Condensers with Ampco 8 Heads and Tube Sheets. These condensers were built for export to the Middle East.

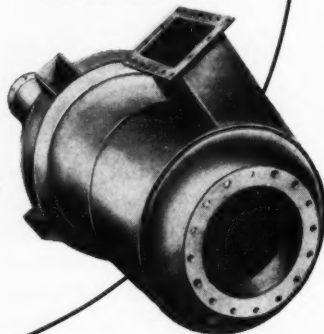


One of six carloads of Heat Exchangers, Coolers, Condensers and Reboilers designed and fabricated by our Heat Transfer Division. Materials used consist mainly of Type 304 Stainless Steel.

One of two all-Aluminum units fabricated by DOWNINGTOWN IRON WORKS, INC. (Welding was performed by the Inert-Gas Metal-Arc method.)



This condenser is 16" DIA. x 12' tube length; Bundle 3/4" O.D. type 316 Stainless tubes; Double tube sheet also of type 316 . . . manufactured by the Heat Transfer Division of DOWNINGTOWN.



## **CORRECT DESIGN—RIGHT MATERIALS**

. . . yes, DOWNINGTOWN's experience and research in the fabrication of various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Cupro-Nickel, Aluminum, etc., may be of help to you. We are equipped with the most modern facilities to handle complete jobs, within our limitations, in the cor-

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*Equiseal*  
stuffing box stops  
all leakage on suction  
heads up to 15 feet

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#### HOW IT WORKS

The *Equiseal* stuffing box arrangement consists of an auxiliary impeller which produces a low pressure area in front of the stuffing box. At 1750 rpm, pressure on the pump side of the stuffing box is zero for suction heads up to fifteen feet and is reduced fifteen feet where the suction head is higher.

If you have leakage or excessive packing wear problems, you should know more about the Allis-Chalmers Type PD Process Pump equipped with the *Equiseal* stuffing box. To get complete information, call your Allis-Chalmers District Office or write Allis-Chalmers, Milwaukee 1, Wis., for Bulletin 08B6615.

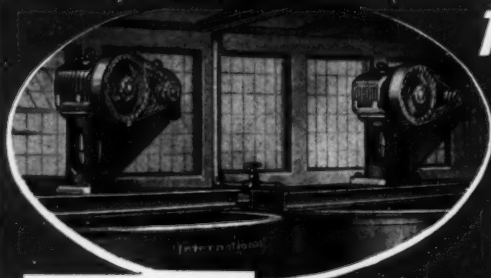
*Equiseal* is an Allis-Chalmers trademark.

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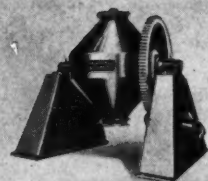


## International<sup>®</sup> *Complete Processing Systems*

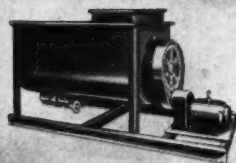
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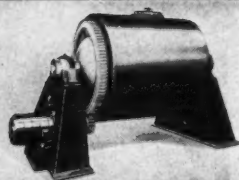
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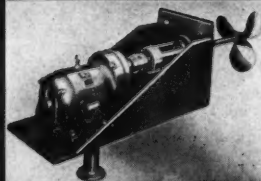
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EDITOR Lee and photographer Payne with their cattle on Payne's Texas ranch.

## Deep in the Heart of Texas

**Our Jim Lee, down in Houston, keeps tabs on the booming, sprawling, high-wide-and-handsome process industries of the Southwest. A great job, he says like a true Texan.**

In all of Texas, there are two full-time editors covering industry developments for U. S. chemical publications. One of them is James A. Lee, our own Southwest Editor in Houston.

"It's a great job," Jim says, "and a great area—nothing like it anywhere else." Jim, who has lived in Houston since 1949, already thinks, acts, dresses and talks like a true Texan—and is proud of it. So are we.

Jim took to Texas like a duck to water. Five months after he went to Houston, Bill Cunningham at the University of Texas wrote him, "You have already become a real Houstonian . . . and are rapidly developing into a dyed-in-the-wool Texan. I am looking forward to the time when we will see you decked out in a pair of high-heeled boots and a ten-gallon Stetson hat."

That time wasn't long in coming.

► **It's the People**—One reason why Jim likes the area so well (other than

the fact that he was born on Weeks Island at New Iberia in the neighboring state of Louisiana) is the open, friendly, easy-going nature of the people down there. No one who knows the Southwest will argue that point.

"As soon as I got down here," Jim writes to illustrate that point, "my friends of long standing went all out to welcome me and to start me on the job—fellows like "Shig" Shigley and Bill Schambra at Dow, Bill Cunningham and Ken Kobe of the University of Texas, Karl Luger of K. E. Luger Co., Ted Lyon at Diamond Alkali, C. E. Butterworth and Jim Schwab of Texas Gulf Sulphur. John, I'm telling you something I realize and appreciate more every day: The people down here are simply tops. . . ."

Texans like their barbecues—and that goes for Jim, too. Several of the chemical companies are already famous for the barbecue parties they throw for their employees and friends.

These are favored occasions when everybody wears sport clothes, plays games, relaxes a little more and enjoys everything to the hilt.

► **Galvanized Texans**—Jim calls himself a "galvanized Texan." I never heard that term before, so I asked him what he meant.

"Well," he said, "every Texan either has oil or dreams about the day he will have it. And every Texan has—or has had—cattle. I'm at the cattle stage right now."

Then he told me about the white-face cattle (see photograph) he has about 50 miles north of Houston at a ranch called Pinchurst Acres. The ranch belongs to a friend, Elwood Payne, industrial photographer whose work is well known on several continents.\* And of course Jim brands his cattle with his own registered brand.

"Not much chemical engineering in this cattle business," he admits, "but a mighty lot of opportunities for experimentation." He doesn't mention whether he's reached the break-even point or not, but what with the price of steaks I can draw my own conclusions.

► **Fun on the Job**—Jim points out how the people in the Southwest help make his job for *Chemical Engineering* a pleasant and rewarding one.

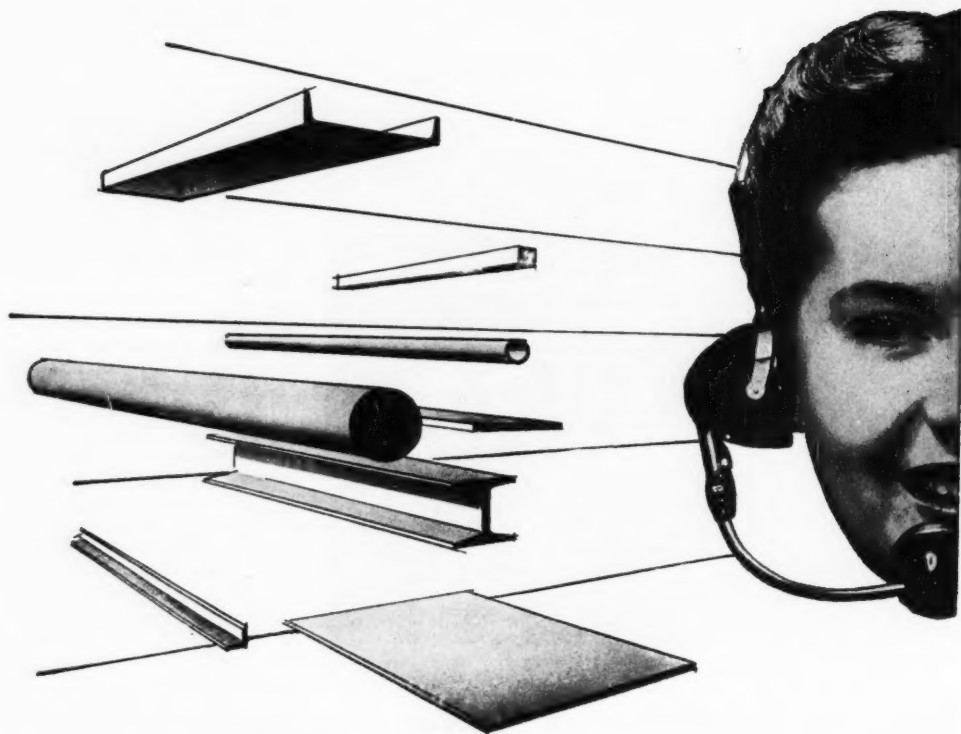
One thing Texans love to do is to make quite a fanfare out of the official opening of new plants (of which there are plenty). And why not, since most of the new plants down there—for sheer size and engineering up-to-date-ness—are well worth showing off.

And occasionally something pops up that makes a plant visit an unforgettable experience. Like the time several months ago when Jim took in the opening of Alcoa's new aluminum pot lines at Port Lavaca.

"Ben Sloane, the new works manager, and I were walking through the pot line to see the first casting poured. Right on our heels was a delegation of congressmen, government bureau chiefs from Washington, company officials and other guests.

(Continued on page 255)

\* Payne thinks nothing of flying to France, Egypt, India, Iran, South America or Norway to photograph new industrial plants. Many of his chemical plant photographs have appeared in *Chemical Engineering*.



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# Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

NOVEMBER 1952

## Double Jeopardy: Engineer-Citizen

Earlier this month more chemical engineers exercised their rights of citizenship than ever before in history. For weeks and months before November 4 many of you worked tirelessly with your fellowmen in advancing the cause of good government. We hope the experience proved interesting and rewarding. And we also hope that from now on the participating process turns out to be a continuous rather than a batch operation.

On this page last month we wrote of some of the hazards the chemical engineer must face in the double role of engineer-scientist. In our daily work we are constantly being judged for our competence in both the theory and practice of chemical engineering. But in our communities and in the world at large we are also being judged for the contributions we make as citizens. Too often in the past we have failed to accept these rights and responsibilities. Will it be different in the future?

There is no lack of social consciousness on the part of the engineer. But too often he seems to feel that he can make his best contribution to society by continuing to develop new processes and products that advance the general welfare. He is quite willing to delegate to others the responsibility for their use and control. He may distrust the politicians, but he seldom subjects their decisions to the same rigorous analysis he applies to his engineering data. Hence, the engineer's infrequent participation in politics is not nearly as effective as it can and should be in the future.

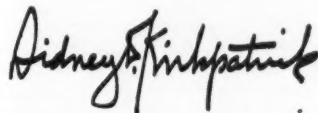
The problems we have to deal with in politics are concerned primarily with people rather than with things. There are no finite answers that can be carried to the fifth decimal. Often the problems are so large and complicated as to call for cooperation and teamwork on the part of many individuals. This means working with people of conflicting interests and capacities. Suspicion of motives and deeply rooted prejudices must be met and answered. It is all too easy for the engineer

to become discouraged—to want to return to his work with inanimate materials and physical forces he can influence and control.

What can we as individuals do to improve our records of citizenship? There is no pat answer. At best, it's going to be a slow process, often of trial and error. One of the obvious perquisites is to learn to like and work with people. Another is to develop more ability in the general arts of persuasion.

Unfortunately, there's too much truth in *Business Week's* recent report of some of the shortcomings of those of us who participated in the Engineering Centennial in Chicago: "Personality-wise, the average engineer is a ripe prospect for a Dale Carnegie course. He feels that his tinkering has had an impact on society, but he has trouble in getting this feeling across. He can't seem to get the slide rule out of his mouth when he makes a speech."

Today, as never before, we are being judged as citizens as well as engineers. It is to our own best interests and those of our profession to see that we get a more favorable verdict from the court of public opinion.



P.S.—General Eisenhower's impressive victory calls for renewed effort and cooperation from all of us. There is a nation-wide job to be done at every level of government. There is a challenge that all civic-minded citizens—engineers included—cannot ignore. There is an opportunity to unite our country behind a program for industry in which science and technology can contribute their full abundance to national progress. To help in building a better America can be chemical engineering's proudest achievement in the months ahead.

# How to Choose the Right Impeller

Open or closed impeller—that is the question when buying centrifugal pumps. The author presents the case for each type, exploding some common fallacies in the process.

## J. A. CABLE

Every time you select a centrifugal pump you have to decide between open or closed impeller. Each type has its pros and cons—there are good reasons why one or the other will be the better choice for any particular application.

To simplify the choice, however, we can set forth an arbitrary rule: Always use a closed impeller whenever you can.

Application of this rule, then, requires an understanding of the exceptions. Here they are:

**Physical Dimensions**—The first consideration concerns the impeller's physical dimensions. These, of course, are pretty well established by the design of the pump itself. The problem is usually encountered only when considering comparatively small-capacity pumps.

Foundry techniques make it inadvisable to attempt casting closed impellers unless the water passages are equal to or greater than the limits shown in the accompanying table. Although this is not a cut-and-dried proposition and will vary somewhat with different foundries, it can be considered as a rough index to such limits. Closed impellers can be cast with smaller passages, but they will be extremely difficult to clean.

Wherever impeller passages are larger than these minimum requirements, therefore, closed impellers can be obtained, even though open impellers may be cheaper to manufacture. Remember, low first cost may be false economy.

**Scale Formation**—Open impellers should be used wherever the liquid being pumped tends to build up a coating or scale on the interior surfaces of the pump. Such a coating on the sidewalls of a closed impeller restricts the flow through the passages

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Dimensional Limits for Closed Impellers

	Approximate Width of Opening Between Sidewalls (Minimum)	Approximate Impeller Diameter (Maximum)
Bronze	1/8 in.	6 in.
	1/4 in.	12 in.
Stainless steel	1/8 in.	not practical
	3/16 in.	6 in.
	1/4 to 3/8 in.	12 in.

and reduces the output accordingly. The scale might also cause binding of wearing surfaces, especially if the clearances are between radial ring fits.

Open impellers will be partially self-cleaning under such conditions and will be less susceptible to binding. Also, open impellers can be cleaned more easily, should cleaning become necessary. This is especially true if cleaning is done by scraping or an acid-bath treatment.

**Suspended Solids**—If the liquid carries solid particles in suspension which are larger than the passages between the vanes, and these solids tend to break up when manipulated, the open impeller has a distinct advantage. There is every possibility that such solids will pass through open-impeller pumps, while they would clog closed impellers.

Concerning this point, you should be reasonably sure that the solids will break up when handled. Certainly it is far better to have an occasional oversize piece plug up a closed impeller than to damage permanently an open-impeller pump in which an oversize solid particle gets wedged between the impeller and the casing or wearing plate.

Many chemical engineers arbitrarily pick open impellers for handling liquids containing abrasive solids. This is almost always the wrong thing to do. Although open-impeller pumps may have a lower first cost, they definitely cost more to maintain, considering both the cost of replacement parts and loss of production during shut-down time.

With open impellers, the abrasive

wear along the edges of the vanes reduces the width of the vanes and appreciably cuts down pump capacity. Even with softer, less abrasive solids, such as paper stock, it has been found economical to use closed rather than open impellers.

Actually, with such services the problem hinges on the type of wearing clearance used with closed impellers more than it concerns the impellers themselves. With radial-clearance wearing fits, it is practically impossible to have the rotating member rotate in a true central orbit, and the clearance, instead of being uniform about its circumference, is actually a continuous wedge shape. Fibrous materials will gradually build up until binding occurs.

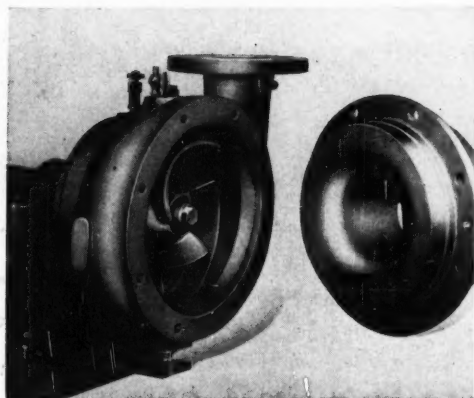
If the clearance is of the axial type, there is no enclosure into which these fibers can be packed, and you have no binding difficulties. Also, with axial wearing clearances, you can provide for adjustment of the clearances to extend the original efficiency performance over longer operating periods.

Many chemical pumps are offered as standard with open impeller only. Such pumps fail to incorporate best design principles.

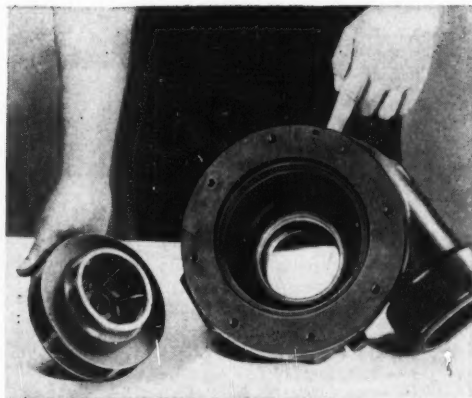
For one thing, the open impeller does not have a companion replaceable wearing surface. After wear occurs to any degree, it becomes necessary to replace major parts, such as impellers and casings or suction covers. With closed impellers and replaceable companion wearing parts, you can renew clearances occasionally and maintain much better over-all efficiencies.

Sideplates with special contoured surfaces are often used with open-impeller designs, or the mating surface of the casing or suction cover has a special fitted shape. This arrangement is not desirable for abrasive services, since it is unlikely that the wear will be sufficiently uniform to allow for much adjustment of this clearance.

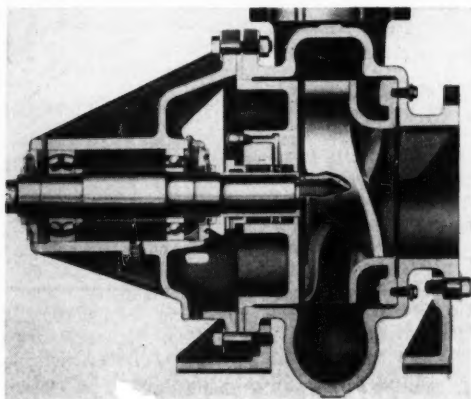




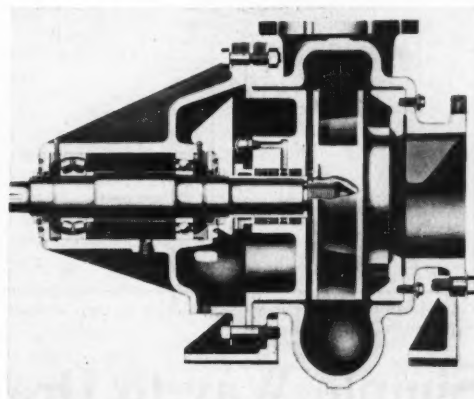
OPEN IMPELLER showing special suction cover with contour matching the shape of edge of impeller vane.



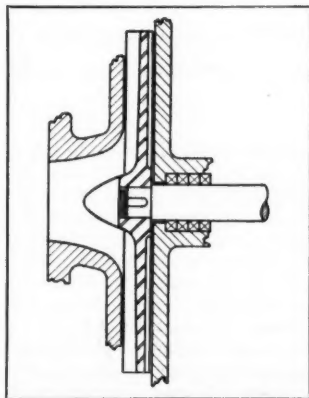
ENCLOSED IMPELLER and casing showing radial clearance replaceable wearing ring.



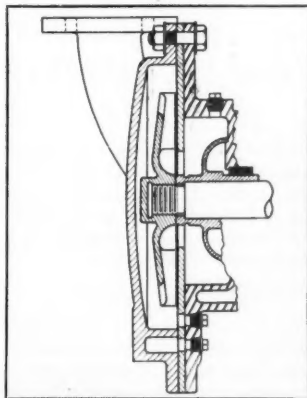
OPEN IMPELLER, sectional view through typical end suction pump, showing replaceable wear plate.



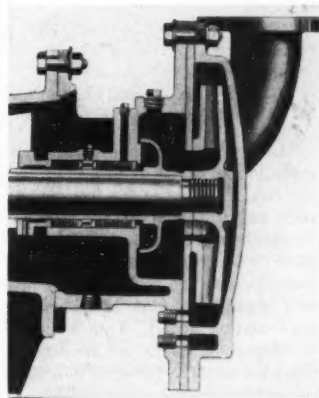
ENCLOSED IMPELLER, sectional view, showing replaceable end clearance wearing plate.



SECTION through typical open impeller chemical pump with no provision for replaceable clearance parts.



SECTION through open impeller process pump. This design can be provided with same wearing plate as pump at right.



PROCESS PUMP with axial clearance ring fit and suction on the shaft side to minimize pressure on stuffing box.

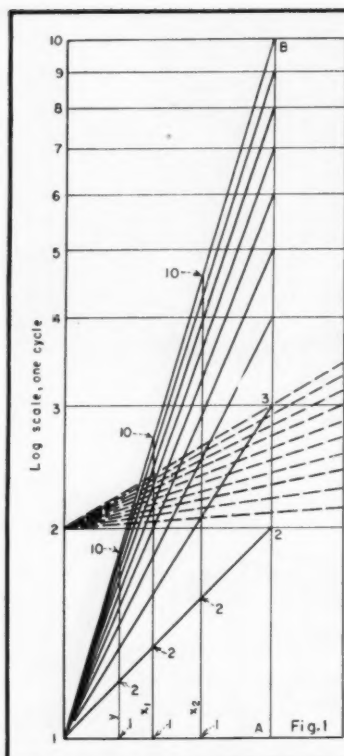


Fig. 1—Logarithmic scales of any desired length are easily obtained by proportion from semi-log paper.

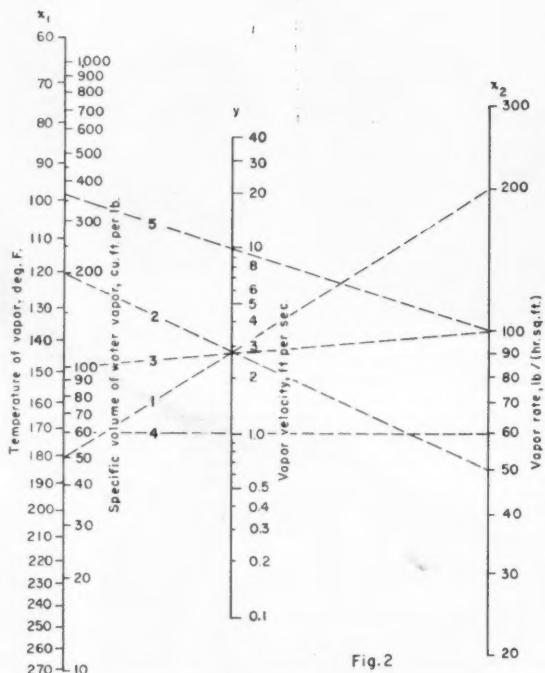


Fig. 2—Sample nomograph for vapor velocity in vaporizers is constructed by five solutions of a simple equation.

## Simple Way to Draw Nomographs

Without having to understand nomograph theory, you can use the methods outlined here in constructing nomographs to fit many of the engineering equations needed in your work.

### M. RHODEN

Many published nomographs do not apply to the needs of the individual engineer. Even when the formula applies, the units may not be suitable. Therefore it is often necessary for the plant or design engineer to be able to draw his own nomographs from his own equations. Unfortunately, the mathematical theory of nomographs is fairly complicated and most engineers cannot take the time to master

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it. That is why the simple non-mathematical method given here for drawing one commonly used class of nomograph is likely to come in very handy.

This class of nomograph is built upon equations of the type:

$$y = c x_1^a x_2^b \dots x_n^d$$

where  $y$ ,  $x_1$ ,  $x_2$  and  $x_n$  are real variables, and  $c$ ,  $a$ ,  $b$  and  $d$  are real constants. This is not necessarily the only type of equation that can be handled by this technique, but the method will be modified for other types.

With equations of this type the

method consists in drawing two parallel logarithmic scales covering the range of the first two variables,  $x_1$  and  $x_2$ , using any suitable scale lengths and spacing between the scales. To locate the position of the third scale for  $y$ , we solve the equation mathematically for at least three different values of  $x_1$ , using a constant value of  $y$ . Then drawing straight lines between the  $x_1$  values and the corresponding values found for  $x_2$ , we find the three lines intersecting at a single point. All  $y$ -values will then lie on a scale through this common intersection and parallel to the  $x_1$  and

$x_1$  scales. To determine the length of y-scale the easiest method is to solve mathematically for two values of the  $x_1$  and  $x_2$  coordinates which will give y-values that are one cycle apart—e.g., 1 and 10, 10 and 100 or 100 and 1,000. How this is done will be shown below.

In constructing a nomograph we need tracing paper and some one-cycle semi-log paper (as in Fig. 1). The semi-log paper permits us to prepare logarithmic scales of any length by proportion. Choose a logarithmically graduated line such as A-B on Fig. 1 and draw lines from a point to each whole number as shown by the solid slanting lines. All vertical lines such as those labeled  $y$ ,  $x_1$  and  $x_2$  are then logarithmic scales of varying length. For closer calibration of intermediate points such as the distance from 2 to 3 the interval may be divided as shown by the dashed lines. By extending beyond the line A-B the calibration may be magnified if desired.

#### DRAWING A NOMOGRAPH

Let us assume that we want to determine the velocity of water vapor in vessels of various diameters for vapor temperatures in the range from 66 to 270 deg. F. We know the vapor flow rate, the cross-sectional area of the vessel, and the vapor temperature. From the total flow rate in lb./hr. and the cross-sectional area we can then determine the unit flow rate in lb./ (hr. sq. ft.), which is to be the basis of the nomograph. The formula then becomes  $V = S \times R/3,600$ , where  $V$  is vapor velocity in ft./sec.;  $S$  is specific volume, a function of the temperature, as will later be determined from the steam tables, in cu. ft./lb.; and  $R$  is the unit flow rate, in lb./ (hr. sq. ft.).

This formula corresponds to:

$$y = c x_1^a x_2^b$$

where  $c = 1/3,600$  and  $a$  and  $b$  are both equal to 1.

We want the nomograph to cover a vapor rate range from 20 to 300 lb./ (hr. sq. ft.), and a saturation temperature range from 66 to 270 deg. F. The steam tables show that the specific volumes corresponding to the temperature range are 10 cu. ft./lb. at 270 deg. and 1,000 cu. ft./lb. at 66 deg. F.

To construct the nomograph we use tracing paper over our semi-log scale-construction chart (Fig. 1) to draw the  $x_1$  and  $x_2$  scales of convenient length and distance apart, calibrating

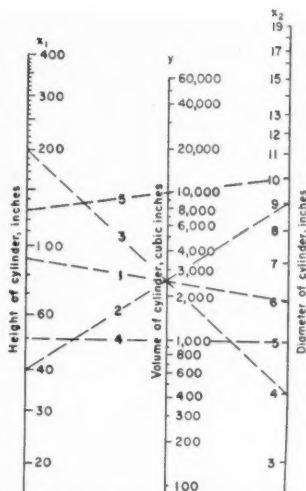


Fig. 3—Sample nomograph for volume of cylinders is constructed similarly to Fig. 2.

$x_1$  from 10 to 1,000, and calibrating  $x_2$  from 20 to 300, as in Fig. 2. Now to locate the y-scale we take three values of  $x_1$  and  $x_2$  whose products give the same  $y$ , for example  $(50)(200) = (200)(50) = (100)(100)$ . These values are located on the scales and plotted as lines 1, 2 and 3, intersecting at a point. Then we draw the y-scale through this point and parallel to  $x_1$  and  $x_2$ .

The next step is to calibrate the y-scale. It will be most convenient to locate the points for  $y = 1$  ft./sec. and  $y = 10$  ft./sec. From the basic equation  $V = S \times R/3,600$ , taking  $V$  as 1 and  $R$  as 60, we find  $S = 60$  cu. ft./lb., these values plotting as line 4 on the chart. Then taking  $V$  as 10 and  $R$  as 100, we find  $S = 360$ , these values plotting as line 5. The intersections of these two lines with the y-scale gives the points for  $V = 1$  and  $V = 10$ , from which we determine the proper scale length (line  $y$  on Fig. 1). This scale is then extended up to 100 and down to 0.1.

To complete the nomograph it is only necessary to add a steam temperature scale to the  $x_1$ -scale, using corresponding values of specific volume and saturation temperature from the steam tables. We can now use the nomograph to read vapor velocity directly from the flow rate and temperature of the steam, as in the completed Fig. 2.

Fig. 3 presents another simple example, the volume of a cylindrical ves-

sel in terms of its diameter and height. The equation is  $V = (\pi/4)hD^2$ . The desired range for  $D$  is from 3 to 19 in. and for  $h$  from 20 to 400 in. The equation is of the form:

$$y = c x_1^a x_2^b$$

where  $c = \pi/4$ ,  $a = 1$  and  $b = 2$ . First we calibrate the  $x_1$  and  $x_2$  scales, using suitable scale lengths from Fig. 1. To find the position of the y-scale we substitute values of  $x_1^2$  into the equation and solve for values of  $x_2$  to give a constant  $y$ . For example, we can use  $x_1 = 9, 6$  and 4 to obtain  $x_2 = 40, 90$  and 202.5 respectively. Plotted, these give the lines 1, 2 and 3 in Fig. 3, which intersect at a point through which the y-scale, parallel to  $x_1$  and  $x_2$ , must be drawn.

Then proceeding as with Fig. 2, we locate the points for  $y = 1,000$  and  $y = 10,000$  by solving the equation for  $x_2$  values of 5 and 10 respectively, thus obtaining lines 4 and 5. The y-scale is then calibrated as before and extended up to 60,000 and down to 100.

For equations of three or more variables, such as:

$$y = c x_1^a x_2^b x_3^d$$

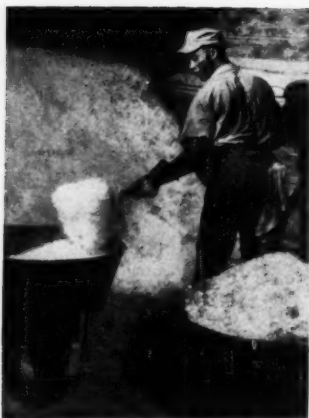
the method is essentially the same. First we use  $y_1 = c x_1^a x_2^b$  and proceed as before. Then we use  $y = y_1 x_3^d$ . The  $y_1$  line may be calibrated only to the extent that  $y$  can be determined. In the final draft of the nomograph, the line  $y_1$  ( $y_2$ , etc.) may be used simply as a reference line, without calibration.

In some cases we have the problem of negative exponents. In the equation  $y = x_1^a x_2^b$  the exponent  $a$  may be smaller than zero, that is, negative, and the y-scale will fall outside  $x_1$  and  $x_2$ . In this case there are two methods that can be used. In the first, we change the expression into the form:

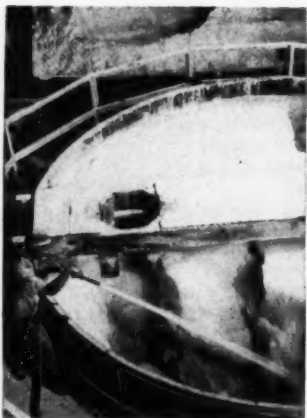
$$y x_1^{-a} = c x_2^b$$

because the exponent  $-a$  is greater than zero if  $a$  is negative. This means that the range of  $y$  must be calculated, after which the procedure is the same as before.

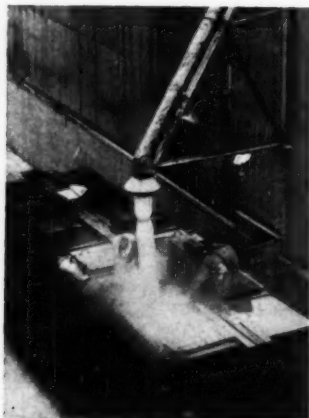
The second way is explained by the equality  $x^a = (x^{-1})^{-a}$ . This means that the variable whose exponent is negative may be scaled in the opposite direction, from top to bottom, similar to the CI scale on a slide rule. Aside from this the procedure is as already outlined.



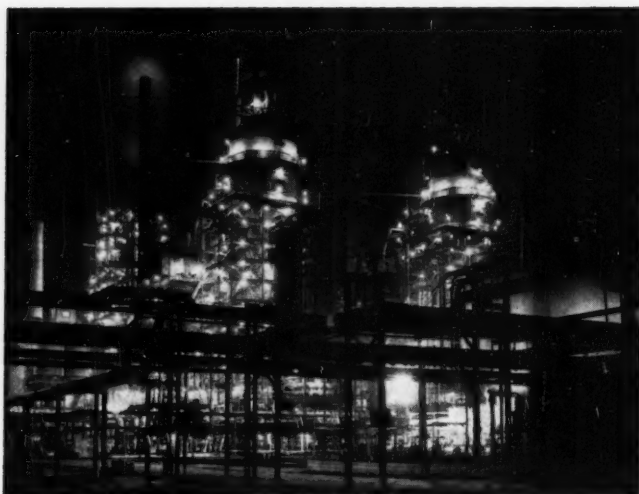
CYCLE starts with raw material.



MANUFACTURE is fairly complicated.



DISTRIBUTION is handled smoothly.



In the U.S. and Canada, 88 fluid cat crackers are operating night and

## Cat Cracker Catalysts

C. O. BROWN and R. B. WAINRIGHT

Today, after only 16 years of catalytic cracking, we have 88 fluid catalytic cracking units operating in the U.S. and Canada with another 24 units under construction.

In those years we've learned a good deal about how to and how not to use fluid cracking catalysts.

### 1. The Right Mix of Particle Sizes Means Good Contacting

One significant thing we've learned is that catalyst particle size has an important bearing on: fluidization and circulation; bed concentration or density; and catalyst losses.

Laboratory work has shown that relatively narrow, coarse fractions of powdered materials give a poor fluid

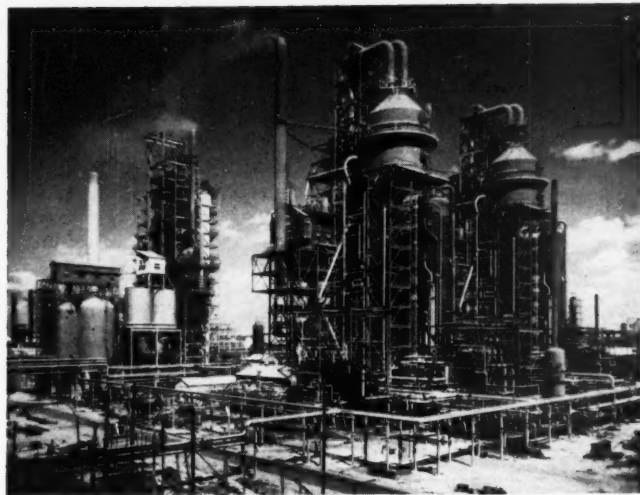
C. O. Brown is a graduate of Cornell and is presently serving as Technical Representative in the Petroleum Chemicals department of American Cyanamid. R. B. Wainright is serving as Acting Technical Superintendent in the department. He is a graduate of RPI.

This article was adapted from a paper presented before the regional meeting, Western Petroleum Refiners Assn., Casper, Wyo., Sept. 26, 1952.

action. For instance, we've noticed that when gas streams are passed upward through beds containing little material finer than 200 mesh or 74 microns, we seldom see the desired smooth turbulence. Instead, a slugging action takes place—large gas bubbles move large masses of powder. The result is that gas-solid contacting is poor, a high degree of surging occurs in the vessel and poor flow properties can be expected to hinder circulation in transfer lines.

At the other extreme, experiments have been made with finely powdered materials—85 percent less than 40 microns. With a bed of this material, low to moderate gas velocities result in channeling and poor mixing. Higher velocities help but carry over excessive amounts of powder from the vessel containing the fluid bed. As expected, the optimum conditions result from a compromise in particle sizes.

Excellent flow properties and generally good fluid action occur when portions of narrow coarse and narrow fine fractions are mixed together. This behavior has taken place over a wide range of linear gas velocities and a notable range of mixing proportions.



Photos on these pages courtesy Standard Oil Co. (N.J.) and Shell Oil Co. day, processing 1.8 million barrels per day of fresh feedstock.

## How They Work Best

These findings aren't absolute. Translating them to commercial operations, we have to allow for variations in unit design. So we can only say that we'll get the best fluid action from a catalyst with an average particle size between 30 and 90 microns, and that the flow properties at the given particle size will also depend on the size distribution centered around the average. A study of the operating data will usually show if the unit is deficient in fines or coarse.

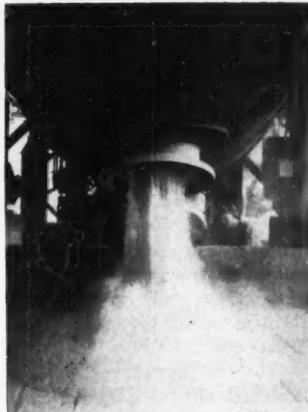
Another factor affecting fluidization and flow is the size of the fresh catalyst added to the unit. Present thinking says that the best approach is to match the size of the fresh material with the equilibrium catalyst. This practice—it's generally conceded—results in lower mechanical losses. But certain units cannot tolerate the practice without serious loss of fluidization and circulation properties.

For example one operator changed to a new particle size grade with less fines than the previous grade. This change cut down the circulation rate, and gave a poor performance in the regenerator, interpreted as less efficient contacting of air with catalyst.

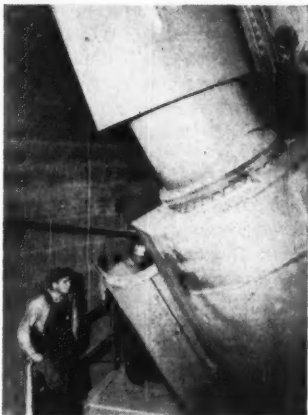
Adding a grade of catalyst with more fines helped greatly. And, significantly, the improvement took place without any detectable increase in the fines content of the equilibrium catalyst. From this the operators reasoned that the fresh catalyst fines functioned as a bed lubricant, although they were present for only a brief period in the unit. From the standpoint of over-all operating economy, it was thought that better operation was obtained when charging catalyst with more fines than the equilibrium bed. It seems possible to justify daily and regular catalyst additions for units with fluidization difficulties, based on this observation.

Attrition is another way to supply fines to the circulating bed. Generally, attrition occurs throughout the unit from collisions of particles. It takes place in two different ways. First, outright fracture of a particle produces relatively large fragments. (This effect obviously occurs during the rounding off process when ground catalyst is charged to the unit. It occurs to a lesser extent with particles that are rounded.) Second, there is

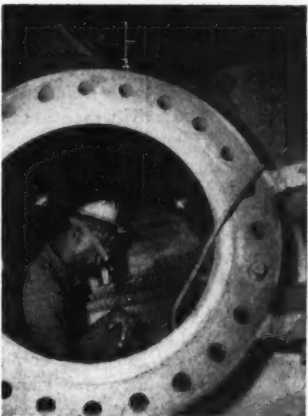
(Continued on page 362)



DRAINING used catalyst is touchy.



OVERHAULING the cracker takes skill.



ERODING equipment means trouble.



# Editorial Viewpoints

## Another Issue in Two Weeks?

Yes, very soon now you'll be receiving another issue of *Chemical Engineering*—your December issue. You can, in fact, expect it within about two weeks after you get this copy.

And then about two weeks after that—shortly after Christmas—you'll get still another. That will be your January issue.

No (to answer your doubts), we haven't yet decided to put out *Chemical Engineering* twice every month. Nor did the heat of the presidential campaign throw our schedules completely out of kilter (but it did interfere mightily with our work). For after January your issues will come, as usual, once a month.

Now the truth of the matter is we're "moving up our publication date"—to put it in an editor's parlance—just exactly a month. That means that your January issue (as an example) will be mailed to you on December 20 instead of January 20—and so on throughout the year.

This is just one of the many changes in *Chemical Engineering* that we will put into effect in 1953. It is a change you have been asking for. And like all the others, it has one purpose: To make this magazine more timely, more interesting and more useful to our chemical engineer readers throughout the process industries.

## Private Ownership of Rubber Plants

During the next year there is likely to be considerable controversy, and perhaps an important decision, regarding the sale of the government-owned rubber plants. The situation has not changed much in the last two years, but there are a few main points which need emphasis because of their growing importance.

(1) If the government sells plants to make styrene, butadiene, or synthetic rubber, it is going to require purchasers to agree to the maintenance of capacities and certain operating activity deemed essential for preparedness. World conditions are not yet such that we dare risk a change toward lower capacity for manufacture of needed quantities of synthetic rubber and the raw materials from which it will be made.

(2) The government is going to make sure that no single company, or any few large firms, get control of so much of the production capacity as to threaten any trend toward monopoly. Even small users of synthetic rubber are going to be protected against serious difficulty in buying rubber to meet their requirements.

(3) And the taxpayer is going to be considered. Uncle Sam is not going to sell facilities which he now owns over the bargain counter, for he believes that

the taxpayer should get back for the Treasury a substantial sum to replace the tax money which was used in building these plants.

In September it was announced that Reconstruction Finance Corporation would proceed shortly by contract with consulting engineers to determine the present value of the rubber plants and those for the manufacture of rubber raw materials. That is only one step toward the development of a policy which will be sent by the President to the Congress early next year, with recommendations regarding the selling of these works for private ownership and operation.

Many chemical firms may find some interest in the possibility of buying a chemical unit, or even in the buying for operation of one of the synthetic or cold-rubber plants. No one can tell whether a plan acceptable to Congress will be proposed by the Executive Departments. Nor will a plan approved by Congress necessarily prove workable. But the whole matter is to be one of active investigation, debate, and later negotiation for the sale of more than a half-billion dollars worth of chemical engineering facilities. The proceedings will deserve close attention by all of us.

## Canada's Chemical Boom

Recent studies made by the McGraw-Hill Department of Economics indicate that for the next five to ten years, Canada can be expected to spend about 30 percent of its total capital outlay on machinery and equipment manufactured in the United States. Canadian producers of aluminum, chemicals, pulp and paper and petroleum products have shown very little interest in the strenuous efforts of European equipment manufacturers—especially German firms—to win a larger share of the Dominion market. American producers have so far bested their competitors on price and delivery and have fully exploited their inherent advantages of being nearer at hand for repair and maintenance operations.

How long will Canada continue to demand capital equipment on the present scale? Opinions seemed to differ from one industry to another. But our observers and interviewers concluded that the large industrial and resources development programs will assure high-level demands for some years ahead. Nor is there too much likelihood of competition from the domestic equipment industry, except possibly for standard items and general purpose machinery.

Not too surprising is the further report that Canada's industrial program is handicapped by the lack of skilled workers, supervisors and technologists. We

have the same problems this side of the border. But we are impressed with the progress being made in engineering education and can foresee the day when Canada's chemists and chemical engineers need look no longer for jobs in U. S. industries.

### **Never Like This in the Old Army**

Gripping is the prerogative immemorial of the enlisted soldier. Nothing soothes the GI ego as much as nursing wounds from the slings and arrows of real or imagined affronts. In fact, old soldiers wisely look for trouble whenever the griping mysteriously stops. Other than as a safety valve, however, griping accomplishes little.

One of the biggest gripes in the highly educated U. S. Army comes from men who are technically trained, only to find themselves carrying on such abstruse engineering operations as whitewashing stones or sweatily wielding the manually operated M1 shovel. This can be discouraging, especially to young men brimming with ambition.

Let's face it. The Army is not a college campus or an industrial research laboratory. Even though opportunities for engineers and other technical men are growing in the service, every GI cannot expect to land such an assignment. Even those who do get these jobs have their share of gripes. What soldier doesn't?

Fed up with this bootless griping, GIs at the Army Chemical Center in Maryland, who happen also to be chemical engineers assigned to technical jobs there, decided to form a professional organization of their own. In the best military tradition, they first took an estimate of the situation. Cpl. John Ward and Pfc. Kenneth Vander Voort broached their idea to Du Pont's Dr. Thomas H. Chilton, former president of the American Institute of Chemical Engineers. He urged them to go ahead. Even the brass was for them. Brig. Gen. William M. Creasy, Commanding General of the Center and himself a chemical engineer, heartily backed the group. Dr. Duncan MacRae, chief consultant to the Chemical and Radiological Laboratories, took an active interest. Close to 250 enlisted men, all chemical engineers, qualified for the organization.

Now the Enlisted Specialists Chemical Engineering Club has wound up its first year of activity. In that span it has drafted recommendations on the reserve status of scientific and professional men, issued a directory of technical personnel at the Army Chemical Center, successfully operated a placement committee, and learned firsthand of new scientific developments from distinguished guest speakers, the most recent being Nobel Prize winner Dr. Glenn T. Seaborg.

Not only has the club eliminated much needless griping, but it is helping these men to keep up with their profession while doing their hitch. And it points to more enlightened use of its enlisted chemical engineers by the Chemical Center. It's doubtful if the

young Ivans in Uncle Joe's military machine could ever have such an organization, and it must dumfound hash-marked regulars who chronically complain about what the Army's coming to.

But it's paying off in greater competence and higher morale. And the pioneering efforts of the Enlisted Specialists Chemical Engineering Club are being emulated by similar groups now functioning at Dugway, Aberdeen, Ft. Belvoir and Camp Detrick.

All in all, what these GIs are doing rates the military's spare and seldom bestowed salute: "Well done."

### **Keener Competition in Transportation**

The railroads are rightly worried by the increasing competition of trucks, aircraft, and waterways. Lately there are two evidences of this which have real significance for chemical industries.

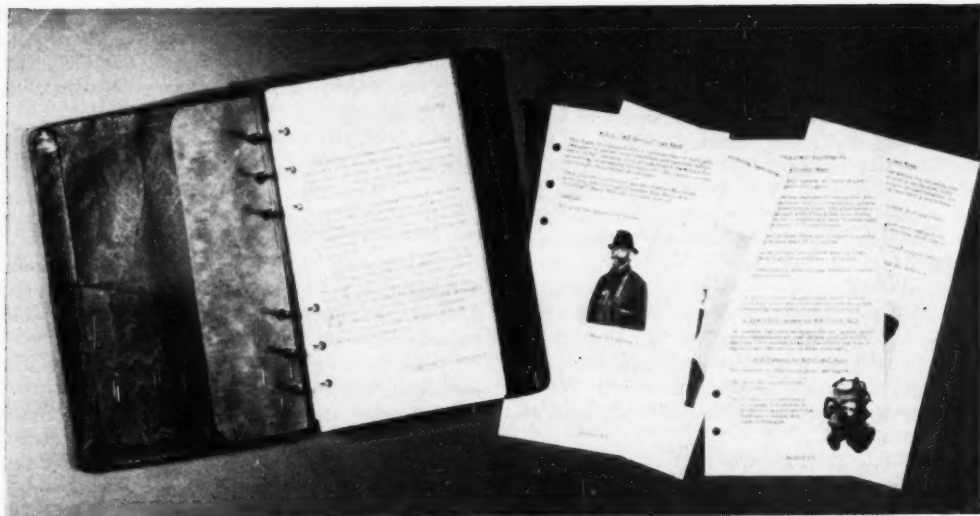
First, we now can see growing apprehension at railroad headquarters lest constantly rising freight rates drive commodities off the rails and onto trucks. Some publicity agencies go to great pains to set forth, as did one recently, the dubious claim that freight rates are only a minor factor in costs.

Every industrial executive who receives or ships great quantities of materials knows that this claim is seldom true. The freight bill of the United States is now many billions of dollars per year. And the typical industrial freight rate is 60 or 70 percent higher than it was only three or four years ago. This means that the ultimate consumer must somehow pay four or six or even ten billion dollars more today as his part of the freight bill than he did before these rate increases occurred.

Second, the railroads are seeking to demonstrate that they must be the only agency to haul certain explosives and other so-called "dangerous articles." In fact the railroads submitted a brief contending that permission for trucks to haul explosives on the highways "is in conflict with the national transportation policy." Thus railroads hope to hold this freight business against the more flexible truck systems in part by the argument that safety and public welfare make them a superior agency, regardless of the relative cost.

Chemical process industries have a serious responsibility in this matter. They must analyze each major transportation project to determine whether there is any real threat to the public safety if something other than freight cars haul their goods. And it is important to know also what is the real over-all cost for each major transportation job when considering both the bill to be paid and the secondary costs of extra handlings, delays, or differences in packaging that may be involved.

Transportation costs are actually a major item in the delivered price of many of our goods. It is up to each management to find out whether one or another agency is the best for the ultimate consumers of its products. A review of long established practices may often disclose important opportunities for economy.



### How We Brought Breathing Apparatus "Home" to Plant Personnel

PAUL C. ZIEMKE, Safety and Maintenance Engineer, Oak Ridge, Tenn.

#### ★ September Contest Prize Winner

A double-barrelled approach to the problem of selling safety and instructing in the use of breathing apparatus has recently proved so successful that it seems worth passing along. We have long been bedeviled by the difficult problem of keeping an ever changing clientel informed concerning the frequently changing varieties of breathing apparatus. We must protect against a host of complex chemical fumes and dusts which requires a considerable variety of respiratory equipment. As new developments come along, and improvements in safety equipment are introduced, plant personnel must be informed, so that the problem is a continuing one.

For the first barrel of our double-barrelled approach we had a metal cabinet built, provided with indirect fluorescent

lighting and equipped with shelves and cup hooks for the display of all types of masks. The unit is finished in neat white enamel with ornate hairline striping in "safety green." It is installed in the main foyer of the plant cafeteria where all and sundry can see it at their leisure. Each item is identified with a neatly printed card, outlining its salient features and uses.

We appreciated, however, that busy executives could not keep such a cabinet at their desk edges. Hence the second barrel of the attack. We devised a complete file of catalog-type descriptions and illustrations for ready reference. These were punched and made up into sets for inclusion in leather-bound loose-leaf books, along with other vital information garnered from the National Safety Council's "Data Sheets." These were then distributed to the supervisory personnel with the reminder that supplementary data sheets would be issued from time to time for addition to the book, and with the invitation from the Safety Department to consult at any time regarding the best way to provide maximum protection. A few of these sheets appear above.

#### ★ October Contest Prize Winner

"Radioactive Tachometer Finds Rpm. of Inaccessible Part in High Temperature Combustor."

A prize of \$50 in cash will be awarded to Ralph L. Belcher, Battelle Memorial Institute, Columbus, Ohio. Mr. Belcher's article will be published in the December Plant Notebook section.

**\$50 PRIZE FOR A GOOD IDEA**—Until further notice the Editors of *Chemical Engineering*, will award \$50 cash each

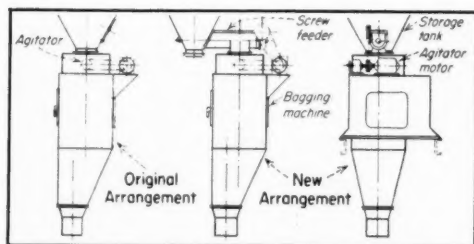
month to the author of the best short article received that month and accepted for publication in the Plant Notebook. Each month's winner will be announced the following month and published the second following month.

**\$100 ANNUAL PRIZE**—At the end of each year the monthly winners will be rejudged to determine the year's best Plant Notebook article, which will then be awarded an additional \$100 prize.

**HOW TO ENTER CONTEST**—Any reader of *Chemical Engineering*, other than

a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Articles which are acceptable but are not winners will be published at regular space rates (\$10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.



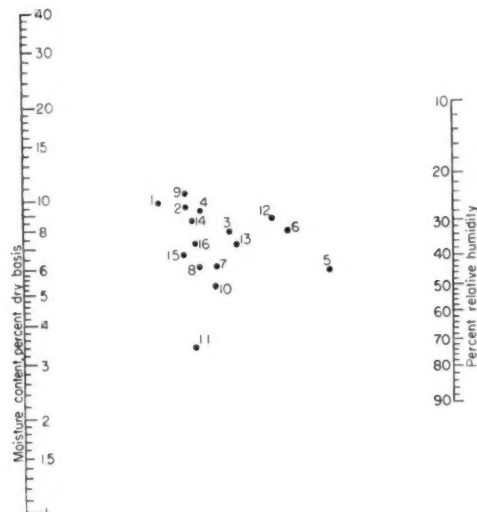
## Improving Bagging Machine Accuracy

H. CHUN HSU, Manager Factory No. 5, Taiwan Fertilizer Co., Ltd., Hsinchu, Taiwan, China.

We use two Model E-50 Richardson bagging machines to bag our hydrated and oiled cyanamide. Due to the fact that the oiled material is not entirely free-flowing, we could not get the inherent accuracy of the machine as claimed by the manufacturer. The error for our 25-kg. bags was usually  $\pm 0.5$  kg., or 2 percent.

We set one of our trouble-shooters, Chen-Chun Lu, to work on the problem. He recommended and designed a small 6-in. diam. screw feeder to be installed between the storage tank and bagging machine (see right above).

The screw feeder is driven by the motor used for the agitator of the bagging machine and its operation is thus synchronized with that of the machine. After the addition of this feeder, the error was reduced to less than  $\pm 0.1$  kg., or less than 0.4 percent.



## Nomograph Gives Moisture Regain

JOSEPH T. HOGAN, Chemical Engineer, New Orleans, La.

The moisture content of a hygroscopic material when in equilibrium depends upon the relative humidity of the surrounding atmosphere but varies widely with different mate-

rials. The amount of moisture contained in a hygroscopic material in equilibrium with the relative humidity of the surrounding atmosphere is properly defined as the hygroscopic moisture; industrially this hygroscopic moisture is frequently termed "moisture regain" and is expressed in parts of water per 100 parts of dry material by weight. Inasmuch as the moisture content of hygroscopic materials varies with the atmospheric conditions and seriously affects the storage and keeping quality of the material, equilibrium moisture data are important to engineers because of their direct application to storage, packaging, processing, and drying problems.

The accompanying nomograph was constructed with the idea that much of the hygroscopic equilibrium data in the "International Critical Tables" and technical literature could be collected and presented graphically as a point coordinate chart.

Suppose you want to know the moisture content of wheat which has been equilibrated under storage conditions of 90 deg. F. and 70 percent relative humidity. A straight edge connecting 70 on the relative humidity scale and the point coordinate (No. 1) for wheat intersects the moisture content scale at 15.3 percent. Hence the equilibrium moisture content of wheat under these conditions is 15.3 percent water on a dry basis, i.e., 15.3 parts of water per 100 parts of dry wheat by weight.

## CONSTRUCTION OF THE NOMOGRAPH

In recent studies Henderson<sup>\*</sup> has developed an empirical equation which has been found to represent conventional equilibrium moisture data and permits calculation of the equilibrium relative humidity moisture content when data on a particular material are limited. Using available experimental data Henderson's equation for the relationship may be expressed as:

$$1 - rh = e^{-kM^n}$$

where  $rh$  = equilibrium relative humidity, expressed as a decimal;  $M$  = equilibrium moisture content, dry basis, percent;  $k$  = factor, varying with the material;  $n$  = exponent, varying with the material; and  $e$  = 2.718, base of the natural logarithms.

Henderson's correlation has been reduced to the simple nomograph above. It eliminates lengthy calculations and plottings and permits the determination of the moisture content to an accuracy sufficient for engineering purposes over a wide range of relative humidity conditions.

Data used in preparing the nomograph were based

## Identification of Points on Moisture Content Nomograph

No.	Material	Temp., Deg. F.	Reference*
1	Wheat.....	90	4
2	Sorghum.....	70	3
3	Soybeans.....	77	10
4	Flaxseed.....	77	12
5	Dried Peaches.....	75	12
6	Dried Prunes.....	75	12
7	Cotton.....	77	6
8	Spray Dried Eggs.....	86	11
9	Colloidal Soil.....	77	1
10	Natural Clay.....	77	14
11	Oven Dried Clay.....	77	13
12	Raisins.....	76	12
13	Wood.....	77	6
14	Rough Rice.....	77	7
15	Whole Peanut.....	77	8
16	Whole Cottonseed.....	77	9

\* Numbers refer to references given at end of article.



largely on information found in the "International Critical Tables" and the technical literature. Conventional plots of moisture content versus relative humidity for most materials yields a sigmoid type of curve, for which the above equation is found to apply. Logarithms of the moisture content of a material plotted on semi-log paper, against relative humidity along the linear axis, gives curved lines for all materials investigated. The relative humidity axis was consequently modified in order to yield straight lines for the equilibrium moisture-relative humidity relationship<sup>6</sup>. Using this tailored relative humidity axis, plots of 16 industrial materials on semi-log paper yielded straight lines, which permitted construction of the line coordinate chart shown.

Suppose extensive equilibrium moisture data for an industrial material not listed in the table are desired. The coordinate point for the particular material is easily found by making two simple equilibrium moisture determinations.

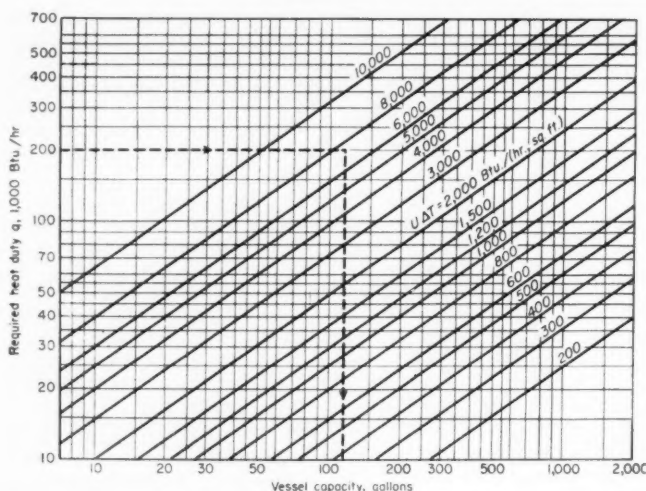
Determine the equilibrium moisture content of the material at 20 and 80 percent relative humidity by methods previously described.<sup>6, 11</sup> Then draw lines connecting the relative humidities, i.e., 20 and 80, with the respective moisture contents found by experiment. These lines will intersect at a point, which is the point coordinate for that particular material. The nomograph may then be used, as

previously described, over the entire range of relative humidities included in the nomograph.

The materials included in the chart are based upon a critical study of available data. Quantitatively, they are correct and can be used where extreme accuracy is not required. Temperature affects the moisture content somewhat, an increase in temperature causing a slight decrease in moisture content for a fixed relative humidity. For accurate determinations of hygroscopic characteristics of materials, such as analytical moisture determinations, the use of previously described methods is recommended.<sup>6, 12</sup>

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#### Chart Selects Jacketed Vessels For Heat Transfer Capacity

W. F. SWANTON, Process Engineer, The Pfandler Co., Rochester, N. Y.

The size of a required jacketed vessel is often determined by its heat transfer capacity. The attached chart enables a very rapid estimate to be made of the size vessel required to meet a given heat duty.

Since the jacketed surface area plots very nearly as a straight line on log-log paper against volumetric capacity for vessels of standard dimensions and since, for the sim-

plified heat transfer equation,  $q = UA\Delta T$  the heat duty  $q$  varies linearly with the jacketed surface area, it is possible to draw a series of parallel lines on log-log paper with each line corresponding to a definite value of the product of the overall coefficient  $U$  and the temperature differential  $\Delta T$ .

To determine the size vessel required for a given heat duty, estimate the value of the transfer coefficient and the temperature differential. Obtain their product and using this value read the required volume directly from the chart. If the distillation is to be continuous, select the standard size which gives a heat duty at least as great as that required. If it is to be batchwise, select the next size larger than this to allow for the fact that the entire

jacketed area will not be submerged except at the very beginning of the cycle.

The temperature differential can usually be estimated very rapidly from the known conditions. The overall coefficient can be estimated from those presented in an article by G. F. Davies (*Chem. Eng.*, **58**, 122, Aug. 1951).

As an example, assume that the required duty is 200,000 Btu. per hour, the temperature differential is 100 deg. F., and the overall transfer coefficient is 75. From the chart, the smallest standard vessel capable of meeting this required duty is 150 gal. This would, therefore, be suitable for continuous operation, but for batch operation, a 200-gal. size would be selected.





## Should You Take a Job Abroad?

### "YES!"

**You can make more money—about 25 percent more.**

**You can save more money.**

**With greater responsibilities, more room for initiative, you can learn more and learn it faster.**

**Your standard of living may be higher than in the U. S.**

Every now and again we hear about some bright young fellow in his early thirties earning \$20,000 a year down in South America or maybe over in Asia some place.

We've tried to corral one or two such young mavericks from time to time but they're tougher to grab a hold of than flying saucers.

But finally we managed to nab a cosmopolite pair—not the thirty-year-old variety—but real seasoned industrial executives.

We caught H. W. Van Ness on the

bounce between India and Egypt. He's a Solvay man from way back (15 years in the alkali business at Hopewell, Va.). In his few days in New York, before leaving for Suez to help manage a calcium nitrate plant, we asked him to tell us a little about his 3-year stay in India. "Nothing technical, just a few interesting highlights to give American engineers an idea of what it's like to work in the Middle East." You'll find his remarks on the next page.

Arnold Beardsley, our other author,

was just back from Venezuela where he had made an extensive personnel, materials handling and warehousing survey for one of the big oil companies. He had a little time before taking off for another assignment in England so he was delighted with our suggestion that he recount some of his experiences for you: "It's like a gold mine down there. And any ambitious young engineer can make his fortune with a little industry and hard work."

But he, too, will tell you all about it in the next pages.

### "NO!"

**Why get mixed up with uneasy political situations, national unrest.**

**It's a long way home if you're physically unsuited to climate, insects, food, rough living.**

**Likewise if you're temperamentally counter to local conditions, customs, laws, natives or associates.**

## What It's Like to Live and Work in India's Clime by H. W. VAN NESS



How are living conditions in India?

We realize that these experiences are not necessarily typical of conditions abroad. They may not even be typical of the Middle East and South America. They are interesting, though, and certainly there's plenty of stimulation for thought for any engineer who's ever toyed with the idea of following a technical rainbow to other corners of the world.

India, itself, is handicapped by a dearth of fuel and many other natural resources. So it will probably never become an important industrial nation—at least so far as the chemical industry is concerned. Besides, the lack of standardization and the absence of rail facilities weigh heavily against all Indian industry.

However, there is still plenty of room for expansion beyond present status in the country.

My experiences abroad have been limited to almost three-and-one-half years as general plant superintendent of a synthetic ammonia plant near Cochin in the state of Travancore.

A New York group, Intercontinent Corp., put up the plant for the Indian firm of Fertilizers & Chemicals, Travancore, Ltd., on the west coast of south India. The climate here was moderate but humid. Maximum temperature was 92 and the minimum 75 degrees.

Excellent housing and living conditions were provided, even to a swimming pool. We were lucky to have our colony and plant provided with all sanitary facilities, including a chlorinated water supply, a condition rare in this part of the world—even among European installations.

For food, many American canned

and packaged goods were available but most people developed an appetite for some of the native dishes like rice and curry. Some foods like bread, butter and milk that we take for granted here in the U.S. are poor in quality or short in supply over in India.

As far as general items of American merchandise went, many were available at higher prices depending on the rate of duty—canned goods and drugs about 50 percent higher and radios and mechanical devices 100 percent. Gasoline was rationed and cost 2 rupees, or 60 cents, per Imperial gallon, while good quality Indian made tires were reasonable.

There is plenty of opportunity for a man to save money in India, though, in spite of the fact that the cost of living has gone up four or five



Can a man learn much on a foreign job?

hundred percent in recent years. As far as taxes go, you don't have to pay a U.S. income tax if you are a non-resident for a complete calendar year, but you must pay an Indian tax which comes to about the same amount.

We didn't have any language difficulties in India because one of the results of British domination was to install English as the only common tongue. However, it was sometimes embarrassing to see some of the lowliest helpers and domestic servants able to use a language foreign to them while we were able to speak only a few words of their native tongue. On the other hand, we were shown every respect as the enlightening beacons of their industrial progress. I might add that the Indians were generally favorable and friendly in their attitude toward foreigners.

Working conditions in India, I found, boiled down to a case (1) of poor management by the Indian administrators; and (2) difficult labor problems.

For instance, the management of the plant I was associated with was overzealous in expanding beyond its resources so there was never enough working capital.

This finally resulted in serious maintenance difficulties involving even the lack of a neoprene repair kit which cost only \$38.

An offer for immediate delivery on used ammonia shipping cylinders was rejected because the price was higher than for new cylinders with one year delivery. Meantime, ammonia sales at \$600 per ton were lost. These sales would have paid for the cylinders many times over.

In the case of native employees, their complete absence of industrial background caused a general lack of appreciation of the need for discipline and strict adherence to standard practices.

After any mishap of any kind in the plant, it was impossible to find anyone to admit having made a mistake. In other words, they did not realize the importance of reporting what actually happened as a contribution toward improved future technique and control. There was one case where an operator was found fast asleep five minutes after a failure in his section had caused a complete plant shut-down.

Safety was another problem.

In one instance, a maintenance supervisor had been warned of the

(Continued on page 158)



Is it easy to supervise Indian laborers?

## Opportunities for the Technical Man in Venezuela by A. R. BEARDSLEY

In the past the majority of North Americans that have gone to Venezuela have been men, and a few women, directly or indirectly connected with the petroleum industry from Texas, California, and Oklahoma. Between five and ten thousand of these expatriates, often with their families, have been spread over the country. Some of these have later gone into business for themselves as contractors, merchants, agriculturalists, professional men and the like.

Your associates today will usually be college men—engineers of all kinds, chemists, geologists, accountants and plain everyday business men in a hurry to make good.

Venezuela is alive and responsive to what we can teach. Visas, apparently, are issued only to those applicants who, demonstrably, are able to contribute to enhancing the cultural and economic life of the country. Drifters and ticket-of-leave men are non-existent.

It goes without saying too that the social and cultural level of expatriates now going to Venezuela is improving. Not too long ago life in the oil camps was so rugged that few but the toughest boys, the boomers and the rough-necks, could stand up under the life. Construction work carried on during the last fifteen years by such companies as Creole Petroleum Corp., Mene Grande Oil Co., Shell Caribbean Petroleum Co. and others has gone far to provide living conditions which in some respects are ahead of those many employees are accustomed to in this country. In particular, Creole publishes a well documented illustrated booklet on



Are Venezuelans easy to supervise?

what a prospective employee may look forward to in their foreign service. There is no need to get into this life blind. Your future employer is as interested as you in your surviving and producing in the new job. Employee misfits are too expensive from a morale and a financial viewpoint.

You, let us assume, are twenty-six, single, a graduate chemical engineer, with three years' experience.

If you can pass a fairly rigid medical examination and your references are satisfactory you may expect a salary of about 25 percent more than the same job rate in this country. This is your base pay. To make it more interesting certain extra emoluments are added in whole or in part, such as:

1. Transportation with all expenses to and from the U. S. A.



Do U. S. men come back better engineers?

2. About six weeks vacation with pay and travel expenses—every two years.
3. Two weeks local leave every between year.
4. An annual bonus of about two months gross pay.
5. Free medical and hospital services.
6. Usually a liberal pension plan. Sometimes, also, a thrift savings plan in which the company contributes to your savings.

Most of your food is imported from the States—much of it is the quick-frozen variety. And you get three square meals a day.

All you miss is the discomfort and stimulus of cold temperatures and weather changes. You learn to stroll and saunter instead of walking briskly.



How does Venezuelan living stack up?

The midday siesta becomes a habit. But it is seldom as uncomfortably hot as our northern cities in summer.

Clothing is a small expense item—white or khaki duck pants and light summer wear is used the year around—except in Caracas where you dress as in New York or California.

In most camps there are social clubs offering movies, dances, music, amateur theatricals, bowling, billiards, swimming, tennis, golf, light refreshments and drinking facilities. If you are not careful you will make much greater use of these drinking facilities than you do at home. You have more time and more companions to say "just one more." But, keeping free of too much alcoholic companionship you will stay healthy and grow rich. You will be able to save your base pay or the greater part of it. Some people are able to save \$5,000-\$8,000 per two-year contract.

If anything, the married man is still better off. Usually he gets a company house and plot that has cost from \$20,000 to \$50,000 to build and equip. For this he will pay \$25-\$75 per month. He gets a liberal living allowance besides.

His wife shops in a large company commissary in appearance much like our smaller super-markets and offering the same merchandise and brands as you find at home.

Well run company schools staffed with North American and Venezuelan college graduate teachers take care of the children. It is a good climate for children and they appear to thrive on the good clean air and constant sunshine.

If you want to make a life-time

career of it you will retire at age 55. With 30 years service you retire on approximately full pay. Retirement at age 55 with \$5,000 or more a year is something to dream about.

If you joined Creole you would find another plus value. For example, an employee with an average gross pay of \$7,000 may contribute \$700 to a thrift fund. In 30 years he would pay in \$21,000. Company contributions would bring this to \$35,700. He would then retire on \$6,300.00 annually with a guarantee of \$58,800.

No one ever died of hard work in Venezuela. The pace is easy—too easy perhaps, and standards of performance are by no means exacting. You make as much or as little of your job as you will. The man who can discipline himself and use the same initiative called for in any similar job in this country will make fast progress—a great deal faster than he can at home. Particularly is this true if he learns Spanish and becomes reasonably conversant with it. Most of our people are satisfied with a smattering of the language, which is not sufficient to carry over the live quality of leadership which is called for in most jobs. Your function is primarily one of guidance, education and setting reasonably efficient working standards. In this field your scope is broad, for in too many cases this leadership has been lacking and some Venezuelans have come to take a dim view of our intelligence and vaunted pre-eminence in technical matters.

It seems usual to work a 5½ day week starting at seven thirty or eight in the morning, taking an hour and a half or more for lunch, and finishing around four thirty. The evenings are long and light. Time for self-improvement and study is obviously plentiful. If you want to push forward your education by correspondence courses you have all the time in the world for it.

There is the usual informal social life in the company clubs already referred to. Library facilities exist. And when social life in the local camp begins to pall—which is often true—visits are exchanged with neighboring camps.

From the foregoing you might conclude that life in Venezuela is all beer and skittles. Obviously it is not or its parts would be crowded with

more immigrants, and North American companies would not offer so many inducements for Venezuelan service. To be sure Venezuela and the life it offers has its critics, but most of its disadvantages seem to be social and psychological.

Camp life, and life in a small colony of North Americans, is something like life on board a ship. You are thrown together in a small social microcosm in which like characters pull closer and closer together and dissimilar personalities push farther and farther apart. Little cliques develop and, if you are not watchful, your circle of friends may soon be circumscribed to include a mere handful characterized by such a common denominator as trade, bunkhouse, profession, age, home state or even salary bracket.

Permanent housing is short too—desperately short—so that you may not be able to bring your family for a year or two—if at all.

It has been argued too that most American expatriates are not emotionally and temperamentally typical citizens. They are "types"—more often running away from something than running to something. Some of these carry their dissatisfaction and inadequacies with them, and spread it around griping at everything.

Then too the newcomer, eager and ambitious, often finds the old timers aloof and indifferent both in work and social life. They apparently want to be left alone to serve their time and to follow their simple virtues of working and living. Or the newcomer may feel that he gets too little assistance—is left to sink or swim in this new unfamiliar life. This is sometimes true too for seniority too often puts drones in positions where authority and leadership is called for. So a large measure of patience is called for or you will feel as they say "kissed off," frustrated, and fed up.

Prices for the things you want to buy in Venezuela are high, usually 2 to 3 times the price of the same merchandise here at home. There is no evading this except by equipping yourself well in the States before you leave and abstaining as much as possible from the visitor vices.

Your social contacts with Venezuelans and their families will be infrequent and inconsequential unless you make a consistent effort to cultivate

them. Don't count too much on romance and glamor. The nice girls are already bespoken. But, to be sure, many of our countrymen find their future wives in Venezuela—particularly if they are located in or near the larger towns and cities. And they say the Venezuelan girl invariably makes an excellent wife.

Some North Americans tend to become bored with the sameness of life, particularly the evenness of the climate. But even in this some Texans and Californians find the climate excellent.

This aspect of company employee training procedure has been largely overlooked by the larger companies. The time is fast approaching when we will realize that each and everyone who is out in Venezuela or other South American countries is an individual ambassador of good-will and the democratic way of better living. You can deck yourself to this worth-while task.

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## INDIA

(Continued from page 156)

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hazards of repairing a gasoline tank. He was discovered testing for residual fumes by means of a torch on the end of a stick—and, believe me, that stick wasn't long enough.

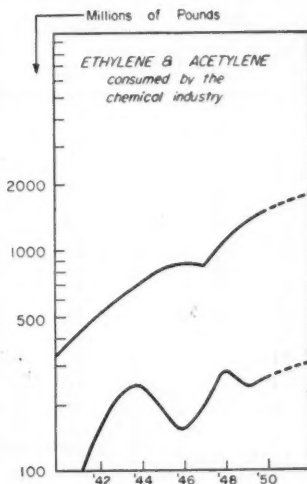
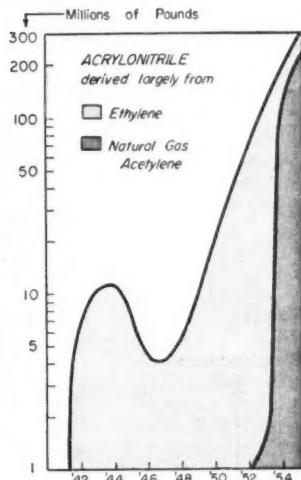
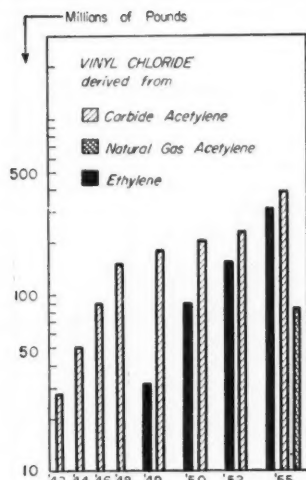
But I've been harping on the difficulties encountered on the job. In fairness to these people, let me say that many more credits accrued during this time than debits, in spite of the lack of experience on the part of most employees.

Now, to get back to the young chemical engineer and foreign service, I'd like to touch upon a disadvantage or two inherent in overseas work.

The engineer abroad will risk developing a wanderlust and may not be content to return to a normal life at home. The higher rates of pay, justified on foreign assignments, may cause him to scorn a good opportunity at home. And he will find that some U.S. companies are inclined to discount foreign service.

But perhaps the resourcefulness, the ability to assume greater responsibility and the general broadening of his outlook on life that the young engineer will get outside his country will make any foreign service years well spent.





# Now Acetylene Joins Petrochemicals

How will this move affect the balance between acetylene and ethylene in supplying synthetic markets common to both? Here is the story of that balance—past, present and future.

CLAYTON F. RUEBENSAAL

The comparatively old, but currently glamorized and rapidly expanding field of petrochemicals has added another important chemical to its ranks. Acetylene will now be produced from natural gas thereby supplementing the national output from carbide generators.

The lever which started the ball rolling was the pressure of consumer demand for synthetic monomers and intermediates. Some of these materials stemming from both acetylene and ethylene seem bent on setting new records for phenomenal growth.

Vinyl chloride for instance jumped from 75 million lb. in 1945 to approximately 300 million lb. in 1950. A capacity of 800 million lb. is forecast by 1955.

Acetaldehyde, one of our most important intermediates, soared in output over 100 fold between 1930 and 1940. Another 40 percent increase

by 1948 brought total production to over 600 million annual pounds.

And the latest entry in the fast growth derby is acrylonitrile which is expected to bound from a 1950 figure of 20 million lb. per yr. to an annual rate of 300 million pounds by 1955.

## EXPAND OR FALL BEHIND

In the raw material race, which is part of this expansion, acetylene has reached the crossroads. Either it joins up as a petrochemical or faces the prospect of supplying a decreasing proportion of the total acetylene-ethylene demand. The reason for this is the lack of expansion flexibility in the calcium carbide industry which has been the source of acetylene.

Facilities for the manufacture of calcium carbide require abundant low-cost power and a readily available supply of high quality coke and quicklime. Plant sites offering a combination of these three items are very much in short supply.

Only a portion of the national calcium carbide production finds its way to the acetylene generator. A sub-

stantial quantity is converted to cyanamide. To meet such a two pronged demand the basic source of acetylene supply is inadequate.

Ethylene by contrast has always been derived from seemingly limitless petroleum or natural gas. So far there has been little need to worry about securing necessary expansions.

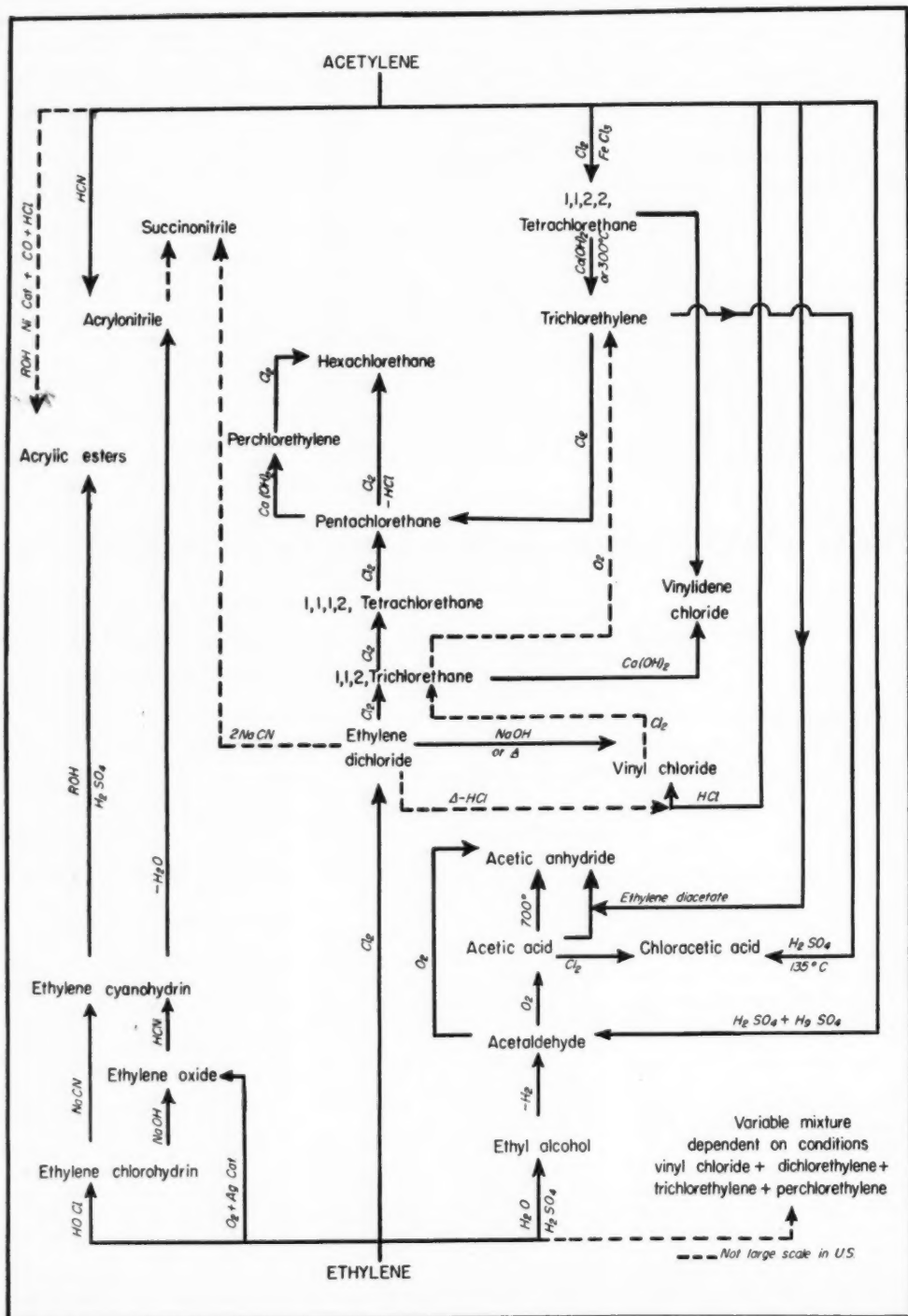
Generally the production of ethylene has been integrated with other petroleum refining operations. Ethane or propane feed stock from cracking operations or from natural gas is subjected to high temperature cracking. The ethylene in the cracked gases is then concentrated and purified by low-temperature, high-pressure fractionation and cold absorption.

Two-thirds of the capital investment in an ethylene plant is tied up in concentrating and purifying equipment. If a gas oil feed stock is used the overall investment is increased by approximately 30 percent.

In order to spread this equipment overhead and keep ethylene costs in line it has been necessary to design for large volume output. In turn

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ethylene consumers have located on neighboring properties to reduce or eliminate transportation costs.

#### ACETYLENE FROM NATURAL GAS

Acetylene produced from natural gas will be a similar large volume operation. Processes for converting natural gas and liquid hydrocarbon feeds to acetylene include electrical, oxidation and thermal cracking techniques.

Although the manufacture of acetylene by an electric arc was first patented in this country, the earliest successful process was employed at Huls, Germany, in 1938. Another American electrical process utilizes a silent electric discharge. This was developed by Dr. E. P. Schoch at the University of Texas.

Patents issued in the early thirties to R. G. Wulff describe the production of ethylene and acetylene mixtures through high temperature, low pressure, vapor phase cracking. Recent licenses issued to Lummus Co., The Fluor Corp., and Girdler Corp. authorize those concerns to build commercial scale plants utilizing this process. Thus the stage is set for the construction of plants designed for this process.

Yet another method is the recent combustion process of a Virginia firm which employs high velocity jet equipment.

But the initial entry of acetylene into the natural gas field will be based on the partial oxidation of natural gas or methane using the Sasche process modification or the closely similar Badische process. Plants now under construction will be designed around these processes. With the advent of this new source of acetylene the balance between ethylene and acetylene may be expected to shift. In 1950 ethylene with 40 percent the unit value of acetylene had a consumption five times as great. Forecasts projected to 1975 anticipate greatly increased consumption of both ethylene and acetylene. At that time the balance is expected to be three and one half to one, still in favor of ethylene. Acetylene by then will be only 25 percent derived from calcium carbide.

#### FREE SUBSTITUTION

To better appreciate the degree of interchangeability of acetylene and ethylene in various syntheses it is in-

teresting to look at the past record.

Acetaldehyde, used for making acetic acid, acetic anhydride and aldol was once synthesized largely by the hydration of acetylene. In recent years expanded demand has been satisfied by synthesis via ethyl alcohol from ethylene. As low cost acetylene from methane becomes available there may be a shift back to the hydration of acetylene.

Still another process complicates this picture. The air oxidation of propane and butane as a seemingly more economical process has been cutting in on ethylene. Also the modified Fischer-Tropsch process involving the oxidation of ethane and propane is yet another process which may invade the acetaldehyde market. There is definite possibility that the future trend will be toward the use of these oxidation processes based on the lower hydrocarbons.

#### BUILDING THERMOPLASTIC WORKHORSE

Monomeric vinyl chloride is the most widely used single component in the plastics industry largely because of its versatility alone or in blends with other resins or rubbers. It is used principally in preparing polymers and copolymers such as Marvinol, Vinylite, Geon and in smaller proportions in Saran. These are used to form films, fibers, sheeting and moldings.

The flexibility of the polymers and copolymers of vinyl chloride has enabled these materials to be processed on almost every type of plastic or rubber fabricating machinery earning them the name of the workhorses of the thermoplastics field. Growth of the polyvinyl chloride type resins to 600 million lb. in the next five years has been forecast by many members of the industry.

Initial production of vinyl chloride in the early 1930's used ethylene dichloride from ethylene. Later, manufacture of this monomer was shifted to the addition of hydrogen chloride to acetylene. In the late 1940's plants were erected in the Southwest for thermally cracking ethylene dichloride.

Today 60 percent of the vinyl chloride is synthesized from acetylene and the remainder from ethylene. Additional capacity is now being installed in the Southwest for the production of vinyl chloride from ethylene and chlorine in a two step process.

Despite this, however, vinyl chloride from carbide acetylene will also continue to show a very healthy growth as expansions are completed in Niagara Falls, Painesville, Ohio and Calvert City, Kentucky.

Another element to keep the balance between ethylene and acetylene utilization will be the expansion of vinyl chloride production from natural gas derived acetylene in Texas.

When vinyl chloride is produced by thermally cracking ethylene dichloride the hydrogen chloride which is split off may be reacted with acetylene to yield another molecule of vinyl chloride. It is quite feasible that a natural gas cracking operation such as the Wulff process, which yields both acetylene and ethylene, could be successfully utilized to produce vinyl chloride by the addition of chlorine to the ethylene-acetylene mixture.

Other patents involving the combined oxidation and chlorination of ethylene, although not commercially developed, may offer still another system for producing this versatile monomer. In addition to the vinyl chloride, variable quantities of di-tri- and perchlorethylene are formed. It is apparent that this system might provide a method for manufacturing chlorinated solvents which would be competitive on a large scale to the time-honored processes using the direct chlorination of acetylene.

#### A NEW STAR IS BORN

End uses for acrylonitrile, which until recently were limited to a relatively few distinct products, are expanding at a fabulous rate. In 1950 85 percent of the output was divided with the major portion going into the Buna N oil resistant rubbers such as Paracil and Hycar, and smaller quantities to the man-made fibers—Orlon, Acrilan and Dynel. The remainder was used in other applications including plastics.

Now this picture has altered. Demand for acrylonitrile is increasing at an unprecedented rate. New derivatives exerting this pressure are the acrylonitrile fibers, soil conditioners and high impact plastics such as Kralastics and blends of Buna N rubbers with vinyls and phenolics.

Current acrylonitrile production is from ethylene via the dehydration of ethylene cyanohydrin. New facilities

to be completed during 1953 will utilize the direct addition of acetylene and hydrogen cyanide, both derived from natural gas. Estimates of 70-100 million lb. have been placed on the capacity of this equipment which is two or three times the country's total existing capacity. Other plants planned for Louisiana and West Virginia will increase this total.

A possibility also exists for the production of acrylonitrile directly from ammonia and natural gas without resorting to separation of the intermediate acetylene and hydrogen cyanide which are formed.

For every pound of acrylonitrile formed, either 0.5 lb. of acetylene or 0.8 lb. of ethylene oxide is required. With the cost of ethylene oxide about 50 percent higher than the highest cost acetylene, it is apparent that the acetylene route has the advantage on the basis of raw material cost. However, equipment cost for purifying the natural gas acetylene, and the more complex purification of acrylonitrile made from this acetylene, contribute to higher ultimate cost. This, coupled with the fact that ethylene oxide facilities now in existence are nearer many of the markets and are partially depreciated, will provide competition by this method for some time to come.

#### FOREIGN ACTIVITY

With this background of our country's activities in ethylene-acetylene chemistry in mind, we'll take a look at other major countries to compare the trends in this field of chemical manufacturing.

The competition in Canada between chemicals from acetylene and petroleum derived ethylene is patterned after the experience of the States. Aldehydes and acetic acid from the huge oil district at Alberta will compete with chemicals derived from acetylene in Quebec.

An interesting although still speculative development could be the piping of Western Canadian oil and gas to the Lake region. This would match the pipeline developments in the States and make low cost hydrocarbon feed stocks available to large chemical markets in the United States and Canada.

In Great Britain development has been devoted to chemicals for ethylene rather than acetylene. Unless hydroelectric resources of the High-

lands can be employed, this will continue to be true and England will never become a major carbide producer. A huge oil cracking plant at Wilton, England has been completed to produce ethylene for conversion to vinyl chloride and other plastic materials.

Germany's wartime carbide production of about 1.3 million tons per yr. in 1942 was two and one-half times as large as this country's production. As a considerable portion of it was destroyed and 192,000 tons lost to the Russian zone only 522,000 tons remained in Western Germany by 1949. This compared favorably with our production of 605,000 tons in the same year. Interest in carbide acetylene in the United States can, however, be judged by the fact that planned capacity will about double this by the end of 1953.

#### FUTURE PROGRESS

The future course of acetylene and ethylene usage in the United States will be governed by a number of general factors. Foremost among these is the freight penalty suffered when shipping finished products, derived from ethylene and acetylene, from the Southwestern petroleum fields to the northern and eastern markets. No relief from this penalty seems in sight other than increasing water transportation for intermediates and finished products.

With the establishment of pipelines from the southwestern gas fields to the new ethane-ethylene extraction plants in Kentucky and Illinois, it was felt that a compromise on the freight penalty had been effected. Although this is true, other factors have narrowed the economic advantage of ethylene derived chemicals. These include such considerations as rising natural gas prices, assessment of gas-gathering taxes, tremendously high investment costs necessary to effect low cost ethylene through large volume usage and finally the large processing capacity required for the end chemicals.

The chief criticism of the carbide industry has been that it reached a technically static state and secondly, that it was increasingly difficult to find sites where both cheap power and raw materials can be found. Although there is some justification for the latter, technical advances have been

made through the employment of larger furnaces, better heat utilization, dust recovery and finally, reuse of the calcium hydroxide byproduct. Here, the dry process for acetylene generation has an advantage in its recovery of dry lime for credit sales to the building industry, or for carbide or other chemical manufacturing.

Whereas plants consuming acetylene derived from natural gas must be located in the vicinity of the generating plant, this is not true for carbide acetylene since calcium carbide is still the cheapest way to transport manufacturing quantities of acetylene any great distance. Thus rail shipped carbide is still the major source of acetylene for chemicals.

Modifications of this practice are the use of truck transportation for moderate distance hauls and pipe line delivery from a central generating plant. This last method has been standard practice in the Niagara Falls and West Virginia areas.

Acetylene from natural gas not only has the advantage of low cost but also a valuable byproduct, synthesis gas, is produced. This gas, containing a mixture of hydrogen and carbon monoxide, could be used in Fischer-Tropsch type processes for the preparation of oxygenated hydrocarbons.

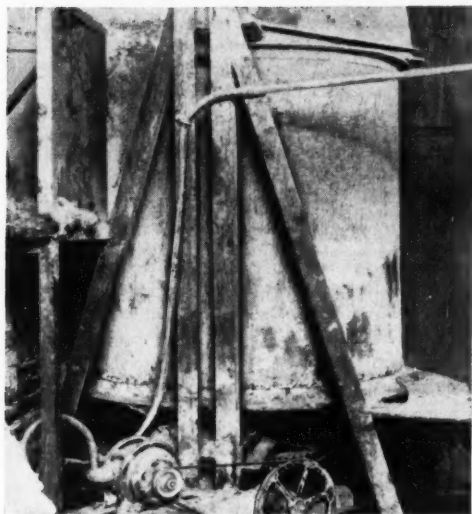
In the final analysis, the rapidly expanding chemical markets insure increasing usage for both ethylene and acetylene. Ethylene from the cracking of propane or ethane will go principally to produce low cost chemicals on very large scale.

The competition between the two courses for acetylene will be keen on some chemicals. It will be eased, however, by new markets requiring low cost, high volume acetylene products from natural gas and by other expanding markets and new products requiring the purity, low investment costs and mobility of carbide acetylene.

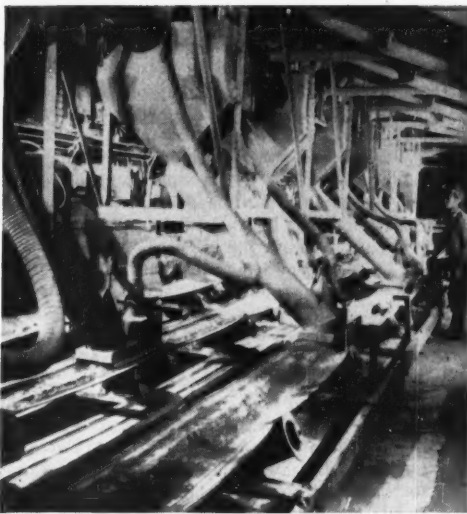
These enlargements of conventional usage coupled with further development of acetylene chemicals (high pressure Reppe reactions, for example) envision a bright future for the acetylene industry as a whole.

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**VOLUMETRIC:** Com-Bin feeder handles stubborn crystals.



**GRAVIMETRIC:** Hardinge weigh feeders meter solids flow.

# SOLIDS FEEDERS

If you have had feeding difficulties with solids and semi-solids, you have probably discovered that information is scarce, and solutions are hard to find. This report will not provide all the answers, but at least it makes a start in that direction.

THEODORE R. OLIVE

CHEMICAL ENGINEERING REPORT—NOVEMBER 1952

**S**OLIDS FEEDERS—especially those for sticky materials and semi-solids—have probably been the butt of more maledictions than any other class of process equipment. In spite of this they are scarcely recognized in the literature. Here and there handbooks or magazine articles describe a few standard types, as if feeding were a routine matter. Ditto, unfortunately, for most bulletins of the feeder manufacturers. And yet, in many, if not most, cases feeders are the problem children of the process engineer. As every operating man knows, solution to a feeding problem very often lies in cut-and-try, in adaptation of existing equipment, or in some ingenious home-made gadget.

**Feeders:  
problem  
children**

It is probably the unpredictable nature of many feeding problems that is responsible for the

poor state of the published art. Nor will this report be able to wrap the situation up into a neat package. Its aim is to pull together information from many different sources, describe what is available, and discuss some of the problems and some of their solutions.

To set up our frame of reference, let us first decide what a feeder is, and how far this report should go. Fundamentally, a feeder is any device that will maintain a reasonably uniform flow of bulk material. In its broadest sense, this includes pumpable liquids and liquid-solid suspensions, as well as gases. However, this report omits fluids and fluid-like materials, if they can be handled adequately with conventional pumps. It deals with solids in bulk, solid-liquid and solid-gas mixtures which may be free-flowing, lumpy, sticky, corrosive, erosive, fluidizable, hot, plastic or pasty. It deals with feeding against pressure or vacuum, with feeding where precision is required, as well as with more usual conditions. Finally, since many materials tend to hang up in bins and

*What is  
a feeder?*

T. R. OLIVE, senior associate editor, has studied automatic control for many years. He maintains that solids feeders are a much neglected part of automatic flow control.

hoppers, and since feeders can function only if the material reaches them, it also deals briefly with bin and bin-discharge problems.

One further distinction is necessary. The term feeder implies a metering function, defined above as "maintaining a reasonably uniform rate of flow." A feeder is thus a "putter-inner" or "taker-outer" with metering abilities of greater or lesser accuracy. But sometimes the problem precludes the dual function and the job of metering has to be separated from that of putting material into a process step, or taking it out.

Almost any sort of materials handling device that can move bulk loads can be adapted to feeding service. Many of them have been—belts, aprons, screws, flights and vibrating conveyors to name the principal ones. These belong to the class of volumetric feeders, which meter their loads as more or less constant volumes per unit of time. But the weight per unit volume of bulk materials can vary widely—as much as 15 percent or more. If a high degree of precision is needed, volumetric feeders ordinarily cannot be used. Instead, we must go to a feeder of the gravimetric type, which passes material at a more or less constant weight rate per unit of time. Precisions in the order of  $\pm 1$  to 2 percent by weight are usual among the gravimetric feeders.

Apart from classifying feeders as volumetric or as gravimetric, there seems to be no particularly useful basis of classification. However, to show the scheme of the present report, here is the somewhat artificial breakdown we have used:

- A. Volumetric solids feeders
  1. Push or carry
  2. Trap and carry
  3. Throw
  4. Handle in fluidized condition
  5. Handle otherwise
- B. Gravimetric solids feeders
  1. Weigh belt
  2. Weigh into hopper
  3. Loss-in-weight from hopper
- C. Solids feeding problems
  1. Flooding and flushing
  2. Pressure and vacuum
  3. Stickiness
  4. Severe conditions: temperature, corrosion, etc.
- D. Semi-solids feeders
  1. Conventional or modified solids feeders
  2. Pumps and extruders
  3. Modifying the material—"tricks of the trade"
- E. Slurry feeders
  1. Pumps
  2. Scoops and "ferris wheels"
- F. Bins and dischargers
  1. Bin design
  2. Bin agitators
  3. Air-aided methods
  4. Vibrators, rappers, pulsating panels
  5. Built-in mechanical dischargers

How this report is set up

### Volumetric Solids Feeders

Many of the volumetric feeders for relatively free-flowing solids in lump, granular or powder form are simple modifications of well-known conveyor types. Several are unique, and not duplicated in principle in ordinary conveyors.

Maintain volume flow rate

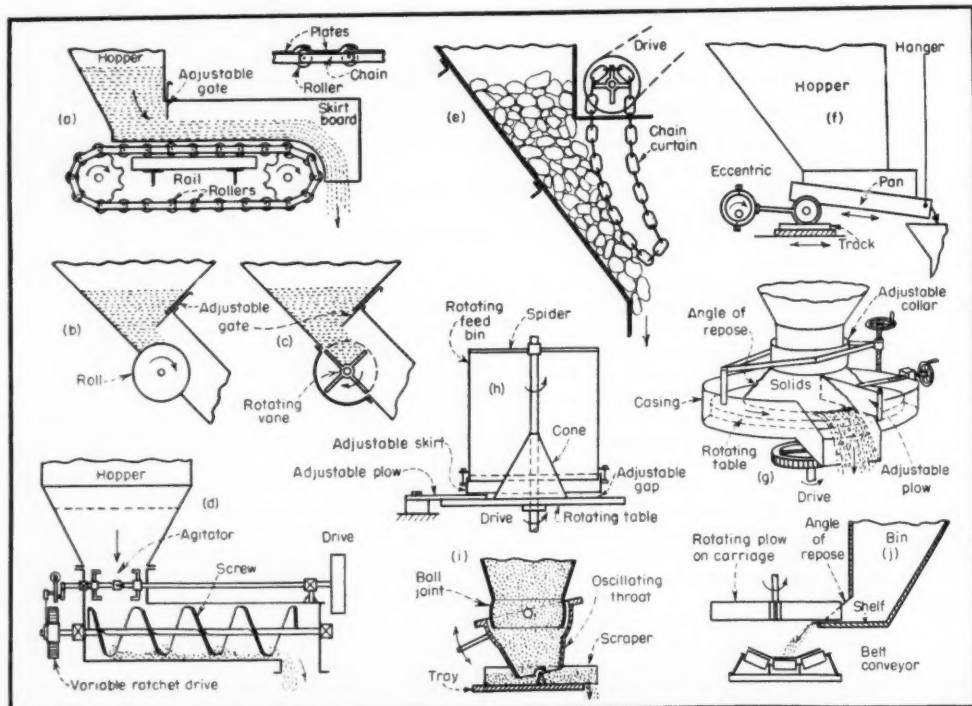


Fig. 1—Volumetric feeders for solids: (a) Apron feeder; (b) open drum feeder; (c) open vane feeder; (d) simple screw feeder with agitator; (e) Ross chain feeder; (f) reciprocating-plate feeder; (g) rotary-table feeder; (h) Pulva Com-Bin feeder; (i) Omega oscillating throat; (j) plow-and-shelf feeder.



**Apron  
conveyor  
feeders**

One of the simplest and commonest types of feeder appears in two general forms: belt and apron conveyor feeders. The apron feeder is a short constant-speed belt conveyor equipped with a continuous belt-like arrangement of roll-supported chains carrying overlapping pans. These have dust-tight joints as in Fig. 1a. The apron feeder is used in handling heavy loads of coarse materials at high-tonnage rates—or it may be used for high-temperature materials. Two methods of control are employed: thickness of the material layer admitted to the conveyor, adjusted by the opening of the bin gate; and speed of the conveyor, which is regulated by the drive speed. Apron feeders are commonly supplied with variable-speed drives. They function by dragging a fairly thin layer of material from the bottom of a bin, under the bin gate; generally they are used to feed coarse crushers and are capable of handling lumps of any size that the crusher will admit.

**Belt  
conveyor  
feeders**

A belt feeder is simply a short belt conveyor, ordinarily supplied with a fabric-reinforced rubber belt. It differs from a conventional conveyor in having little or no trough to the belt, and in being supplied with skirt boards to prevent material loss. Generally such a feeder is supplied with a variable-speed drive as in Fig. 2. In the particular model shown (Hardinge Co.) the feeder is provided with a feed hopper integral with the skirt boards, as well as an adjustable gate. Otherwise the feeder would have to be supported beneath a suitable feed bin equipped with a control gate. Such feeders are useful for small quantities, to considerable tonnages, of fairly fine, free-flowing materials. In the smaller sizes they handle lumps up to about 2 in., and in the larger sizes to about 1 ft. Control, as with the apron type, is by belt speed and bin gate opening. Neither belt nor apron feeders can be used with materials that tend to aerate and flood.

**Open  
drum  
and star  
feeders**

If a belt feeder is shortened to the point where head and tail pulleys merge, and the belt disappears, we have the roll feeder illustrated in Fig. 1b. Quite similar is the open vane or star feeder of Fig. 1c. These feeders (Hewitt-Robins Inc.) differ in one important way from the belt, in illustrating the part that angle-of-repose plays in several feeder types.

When any free-flowing bulk solid is piled on a flat surface it shows a characteristic angle of the side of the pile with respect to the surface, called the angle of repose. This angle depends on the physical properties and state of the material, chiefly on the fineness, surface condition and shape of the particles. Hence, two samples of the same material may have differing angles of repose if the particle sizes differ widely. Even with different methods of grinding the angle of repose may be different due to variations in particle shape. In general, angles of repose are in the range from about 30 to about 40 deg.

But for sticky material the angle may approach 90 deg., and for fine, aerated material it may approach zero.

Distinction must be drawn between angle of repose and angle of slide. The angle of repose is that angle at which material just fails to slide on itself. The angle of slide, however, is the angle of slope which will just start a given material to sliding on a surface other than itself—on a steel plate, for example. Angles of slide are generally a few degrees less than the angle of repose, since the friction of a material against a continuous surface (e.g., steel plate) is ordinarily less than against itself. However, for certainty, chutes and bin walls are commonly sloped at 45 deg. or more.

Returning to the roll and vane feeders of Figs. 1b and c we see how both angle of repose and angle of slide enter into the design. When such feeders are stationary the material is held back at its angle of repose, or some lesser angle, due to the presence of the drum or multi-vane wheel—provided, of course, that the gate is not set too wide open. On the other hand, to avoid leakage over the drum, owing to the angle of slide, the drum must be of relatively large diameter or ribbed to increase the friction. Then, when the drum rotates, material is dragged out of the static column of solids by friction and discharged over the face of the drum. In the vane type the positive effect of the rotating vanes is added to the frictional effect of the plain drum. Control with feeders of these types depends mainly on the speed of the drum, rather than on gate setting.

Feeders of the open drum and vane type have been used considerably in the mineral industries where they handle free-sliding lump and granular solids. Much more common in process work is a modification of the feeder of Fig. 1c in which the vane wheel is enclosed (see Fig. 5a). This type will enter our discussion a little later.

The familiar screw conveyor is the basis of a much used type of feeder for finely ground and granular materials. Generally a screw is run only partially full. With most materials the flow will not be strictly continuous, but rather in a series of surges which is sometimes evened out by equipping a few inches of the discharge end with paddle arms instead of a helical flight. Some screw feeders use a double-helix screw to increase capacity and even out the delivery. Variable-speed drives of either continuous or ratchet type are common. The feeder diagrammed in Fig. 1d is shown equipped with a hopper agitator on the higher speed drive shaft, and a ratchet drive as used by the B. F. Gump Co. This particular drive has two ratchets driven alternately by an oscillating arm with a variable throw which can be adjusted from zero to a maximum during operation. Motion of the screw is thus discontinuous, consisting of two advances for each revolution of the drive shaft. In an-

Repose  
vs. slide

Drum  
feeder  
design

Screw  
feeder  
variations

other type of ratchet drive having a single ratchet, the amount of ratchet stroke which is effective in turning the screw depends on the setting of a movable trip which can be set to advance the ratchet wheel from a single tooth to about 90 deg. for each revolution of the drive shaft. Feeder screws range from about 2 in. diameter to as high as 12 in. A 12-in. screw at 17 rpm. will deliver about 35 tons of 100-lb. per cu. ft. material per hr.

For light duty, screw feeders are usually supplied with fabricated troughs. Heavy duty feeders are sometimes provided with cast iron boxes if erosion is a problem.

**Ross chain feeder**  
A novel feeder used mainly ahead of crushers in the mineral and rock products industries is the Ross chain feeder shown in Fig. 1e. This consists of a curtain of heavy endless chains supported on a horizontal shaft carrying projections which engage with the links. The chains lie on the material in the discharge chute and hold it back, allowing it to discharge only at the rate the chains are driven. This feeder can be made in widths as great as 20 ft. to handle large tonnages with considerable accuracy.

**Where flights fit in**  
Flight conveyors of the type in which a continuous chain or cable travels in an open or closed trough or pipe, moving the material by means of solid or U-shaped flights, can be used for fine material feeding in some cases. This is especially true where it is desired to combine the functions of feeding and conveying over more than a nominal distance. This class includes the conveyors of the mass-flow type such as the Redler which, because they run full, can feed with considerable accuracy. One function of such conveyors in feeding is to supply material to a number of pieces of equipment which may consume the material at varying rates. In this sort of set-up the conveyor is of the run-around type, feeding at the several discharge

points only when and as rapidly as the discharges can take it away. By the same token the conveyor itself receives material from its supply hopper only as fast as it can take it.

**Reciprocating plate feeder**  
A type of feeder which appears in several modifications, the reciprocating-plate feeder, is portrayed in Fig. 1f. The device is simple, quite accurate, and widely used for medium to coarse material such as coal, stone, ores, sand and the like. It is easily constructed for large capacities and heavy-duty service. The modification shown in the diagram will serve to explain the principle of all types. Here a flat or slightly sloped pan is used as the bottom of the bin. The pan is carried on four wheels on a track, or one end is on wheels, the other carried by hanger rods. A crank or eccentric with a maximum throw of about  $\frac{1}{2}$  ft. pulls the pan back and forth about 30 to 60 times per min. At the front of the hopper is an adjustable gate which controls the depth of material carried by the pan. At the back the hopper skirt board extends down almost to the pan, so as to prevent backward movement of the material. When the pan reciprocates the first forward movement pulls some of the material under the gate and out of the hopper. Before the pan reverses new material descends to take the place of that pulled out so that when the pan retracts the material remains stationary and the pan slides under it. The second cycle repeats. Moving new material out of the bin, it pushes the initial material closer to the discharge end. After a few cycles equal amounts of material then discharge with each stroke.

Control of such feeders is obtained by the setting of the gate and the length of the stroke. For this control plate feeders are supplied with adjustable cranks or eccentrics. Two feeders linked together at their discharge ends can be operated by a single drive—an arrangement that is sometimes used to feed from a long hopper such as a double track hopper, or from a pair of adjacent bins. Both the horizontal and the sloped type of pan are commonly used, some manufacturers preferring the latter since gravity helps in the discharge.

**Plunger type feeder**  
A feeder which is less common than the reciprocating-plate type, but is similar in principle, is the plunger feeder which uses a rectangular box-like pusher driven back and forth in a horizontal trough by a crank or eccentric. The situation is the same as if the pan in Fig. 1f were held stationary and the back skirtboard were reciprocated. Capacity adjustment is obtained by changing the length of stroke.

**Rotating table feeder**  
One of the most useful and important principles used in feeders is illustrated by Fig. 1g which shows a rotating disk or table feeder. The particular design illustrated is that of Traylor Engineering & Mfg. Co., although others of very similar type are on the market. There are also a number of feeders which work on variations of this principle.

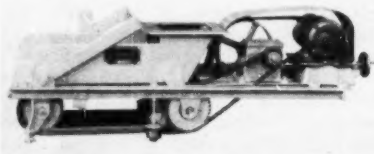


Fig. 2—Hardinge volumetric belt feeder.

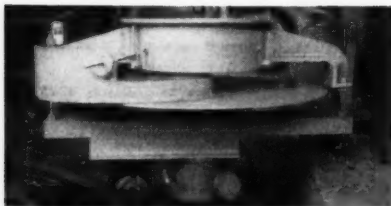


Fig. 3—Hardinge rotating-table feeder.

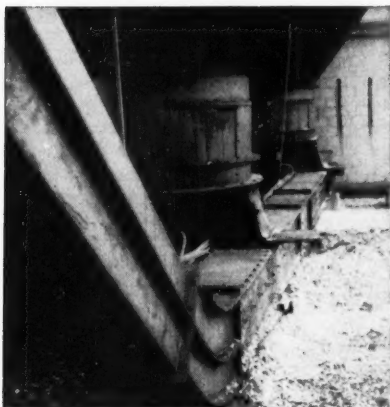


Fig. 4—Stephens-Adamson single-stage discharger.

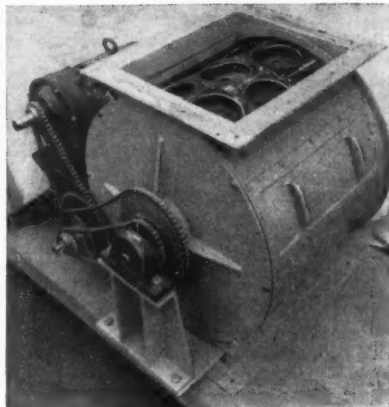


Fig. 6—Richardson flexible rubber-pocket feeder.

Plows from  
a cone

The idea behind this feeder is the fact that granular material will issue from a downspout on to a flat surface in a cone, the size of which depends on the gap between downspout and surface, and the angle of repose of the material. If now the surface is a disk which is rotated, and a stationary plow is inserted into the rotating cone of material, part of the material will be sliced off by the plow and slid off the edge of the disk. New material will descend to replace that sliced off so that the bite of the plow will remain constant. Control depends on the speed of the disk, the gap between the downspout and the disk, and the setting of the plow. In practice, the latter two variables are the ones adjusted to control the feed rate. The sketch shows one method of adjusting the gap, using a sliding sleeve on the spout. Fig. 3 (Hardinge Co.) shows another method in which a slotted skirt is bolted at adjustable height to the central feed hopper.

Such feeders are made with disk sizes ranging from a few inches to as large as 6 ft. in diameter. The larger ones can handle lumps up to 5 or 6 in. and capacities up to about 100 tons per hr.

Com-Bin  
table  
feeder

Fig. 1h shows the construction of a modification of the disk feeder, a new type made by Pulva Corp. It was developed primarily to feed wet, sticky materials and will therefore be described in more detail under that heading. However, it is also used for dry materials, especially those that normally give trouble. It combines a storage or surge bin with a feeder and so is called the Com-Bin. It differs from the conventional disk feeder mainly in the fact that the entire cylindrical bin rotates with the disk, being supported from the central shaft by a spider carried by the shaft. This leaves a clear, adjustable gap between the bottom of the bin and the disk through which material is removed by a thin, stationary plow. A central cone (and sometimes a vertical cutter attached to the plow) assists in

feeding material to the plow. The adjustment of the gap between the bin and the disk depends on the characteristics of the material handled. Feed rate is regulated by the thickness of the plow, the distance it extends into the gap, and the rotational speed of the feeder.

Some similarity to the conventional table or disk feeder is evident in the oscillating-throat feeder used by Omega Machine Co. in its Universal feeder for dry materials, such as water-treating chemicals. The lower part of the feeder appears in Fig. 1i. The conical hopper is fitted at the bottom with a ball joint making a dust-tight movable connection with the oscillating throat. Beneath the throat is a stationary tray on which the material rests. Since the tray can be raised or lowered, the gap between tray and throat is adjustable. In operation the throat is oscillated back and forth through a closely adjustable angle. Movement of the throat moves a scraper resting on the tray which pushes material from first one end of the tray, then from the other, with each oscillation. Feed rate is controlled through a 40:1 range by a micrometer screw adjustment of the stroke of the mechanism which oscillates the throat. These feeders, in three sizes, can handle from 1 to 5,000 lb. per hr.

Oscillates  
its throat  
to feed

The last of several table feeder modifications is shown in Fig. 1j. It operates on the same principles—in reverse—as the table feeder method. Instead of a stationary plow and rotating table, such feeders use a stationary table and rotating plow. In Fig. 1j (Hewitt-Robins Inc.) the plowing mechanism consists of a number of arms radiating from a vertical shaft and rotating in a horizontal plane. In a comparable type (Improved Paper Machinery Corp.) the plowing mechanism is actually a pair of counter-rotating screws which extend out over the shelf and into the bottom of the bin. In both types the material is stored in a long bin having a

Plows from  
a shelf

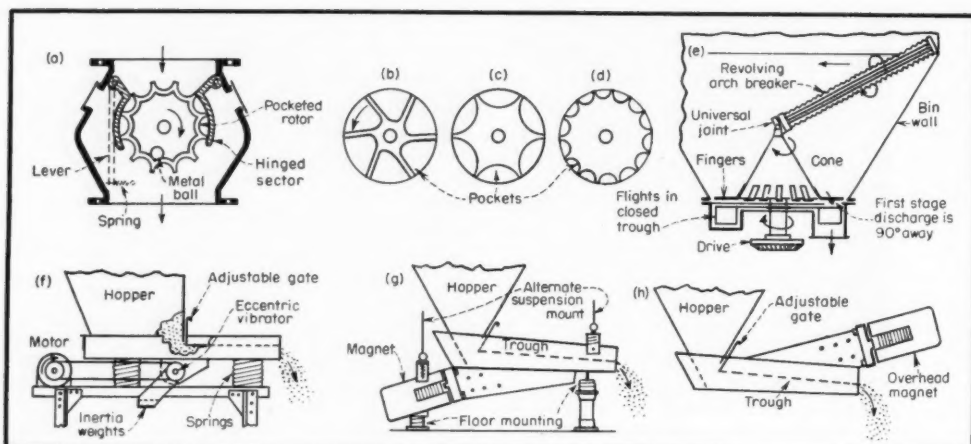


Fig. 5—(a) Fuller rotary-pocket feeder; (b)(c)(d) standard rotor shapes for Draver "wing" feeder; (e) Stephens-Adamson two-stage feeder-discharge with arch breaker; (f) Robins Vibra-Feeder; (g)(h) under- and over-driven electric vibrating feeders.

shelf at the bottom and a slot between the shelf and the near side. Material stands on the shelf at its angle of repose. The plowing device is mounted on a carriage running on tracks parallel to the bin and spanning a belt conveyor. In operation the carriage shuttles back and forth from one end of the bin to the other, plowing material out of the bin and on to the belt. Such feeders or unloaders are used for ores, bulk chemicals, wood chips and for removing coke from a cooling wharf.

One modification of the discharge mechanism shown in Fig. 5e falls in the class of "push or carry" feeders we have just been discussing. Stephens-Adamson Mfg. Co. builds this device also in a single-stage form for feeding non-flooding dry solids from bins (see Fig. 4). The lower trough and flights in Fig. 5e are omitted and a baffle is installed over the outlet to prevent material from moving directly downward from the bin to the discharge. This discharger consists of a rotating cone carrying fingers attached to the bottom periphery. The arch breaker may or may not be used, depending on need. Rotation of the cone shaves material from the bottom and carries it under the baffle to the discharge at a uniform rate.

The feeders we have been considering in the foregoing section have all operated by pushing or carrying a layer of material of more or less controlled thickness. Another class of volumetric feeder traps the material within a definite volume and carries it to the discharge. The commonest representative of this class is the enclosed rotary-pocket feeder which goes by various names such as the star, rotary lock, vane, drum, wing, etc. This feeder is a development of the open pocket type shown in Fig. 1c. Because it is enclosed it can operate against a small pressure differential (see later section on pres-

sure feeders). It is built in many modifications, all of which can be illustrated so far as principle is concerned by Fig. 5a. This particular feeder is made by the Fuller Co. It consists of a drum with cylindrically grooved pockets parallel to the elements of the periphery, mounted on a horizontal shaft. The drum is confined between a pair of hinged sectors at the sides (which relieve if tramp iron or large lumps enter the feeder), and the housing end plates at the ends. Clearances are in the order of 0.006 in. As the drum rotates the pockets fill and carry material down to the discharge. Cast iron balls inside the drum serve as rapping devices to insure positive discharge.

The use of spring-loaded hinged sectors is an unusual feature of this particular feeder. Commonly the drum rotates within a cast-iron cylinder having feed and discharge openings at top and bottom. Depending on conditions the shaft may or may not be packed where it passes through the ends of the housing. Some designs journal the shaft in bearings attached to the housing ends, but most use outboard bearings. Close clearances are the rule. For example, Sprout, Waldron & Co. uses a 0.003 in. clearance and insures discharge by taking pains to have a smooth finish in the pockets. Often these are chrome plated or given a Lithcoat coating.

Figs 5b, c and d show the three standard rotor designs used in the Draver feeder (B. F. Gump Co.). The number of pockets depends on the kind and quantity of material to be fed and varies with different manufacturers from a minimum of four to as many as 60. Most such feeders use continuous pockets throughout the length of the drum. The Draver design is unusual in that the individual "wings" are only a few inches thick and a complete rotor is built up by assembling as many as needed on a shaft. They

Star  
feeder  
design

Uses  
"spiral"  
pockets



are arranged in a spiral and separated by circular plates so as to form individual pockets. As the drum rotates the spirally arranged pockets discharge serially so as to give a continuous out-flow. Continuous discharge is provided in the Fuller type (Fig. 5a) by cutting the lower edges of the hinged sectors at an angle.

Delivery rate of such feeders is controlled by the drum speed. Both continuously variable and ratchet-type variable-speed drives are used on feeders requiring feed-rate variation. Rotary-pocket feeders are made in capacities as high as 2,000 cu. ft. per hr.

**Handles floodable materials** One important feature of the rotary pocket feeder is the fact that it does not present an open passage from inlet to discharge, and therefore can be used for materials which aerate and flood (flush). Fig. 6 shows a special drum used by Richardson Scale Mfg. Co. for materials which flood badly, as well as sticky materials. The drum surface contains flexible rubber pockets which are actuated by an internal crank and connecting rod mechanism. The pockets are at full capacity during the filling and carrying parts of the cycle, but are pushed out at discharge. There are also other methods for handling sticky materials.

**S-A two-stage discharger** Another feeder which can be used for materials that flood is the two-stage discharger built by Stephens-Adamson Mfg. Co., and shown in Fig. 5e. The first stage is the rotating cone-and-finger arrangement already described. Beneath the discharge is an annular trough containing a number of solid web flights only slightly smaller than the trough. Material is agitated in the first stage by the fingers and pushed into an opening to the second-stage trough. There the solid flights carry it around a 270-deg. arc and drop it from the discharge opening. This sketch also shows a revolving arch breaker driven by a universal joint attached to the central cone. This can be installed initially, or added later if found to be necessary. The arch breaker is a beam of X cross section, formed of serrated vanes and carried at its outer end by a cast steel spider rolling on the bin. If the material tend to arch this device will cut it loose and allow it to drop to the discharge. The arch breaker is not forced to roll around the bin but can, if stuck, continue to rotate on its axis at one point until it has cut through the obstruction. It then resumes its tendency to roll.

**Mechanical vibrating feeders** Another class of volumetric feeders moves the material by throwing (or backing away suddenly), rather than pushing or trapping. This class includes the mechanically and electrically vibrated feeders. Fig. 5f illustrates the mechanically operated Hewitt-Robins Vibra-Feeder. A pan mounted on springs is vibrated by a single-shaft vibrator driven by a belt. This shaft is journaled in bearings attached to the pan and has eccentric bearings in connecting arms carrying inertia weights. Rotation of the shaft causes the pan and weights to move alternately toward and

away from each other with an amplitude inversely proportional to their respective weights. The arrangement prevents transmitting vibration to the supports which may be either a floor mounting or a suspension. The effect of this motion is to throw material forward a short distance while the pan moves downward and back. Amplitude and hence capacity are said to be greater than for electrically vibrated types.

Figs. 5g and h show electrically vibrated feeders with the magnet mounted below, and above, the feeder trough. The first is the more usual arrangement. Mounting the magnet above is an expedient used where headroom is limited. These feeders can be either floor mounted or suspended. The power unit consists of an electro-magnet and armature, the latter connected to the center of a group of powerful spring bars so that when the magnet is provided with alternating current or pulsating direct current (both are used), the armature is first pulled toward the magnet, flexing the bars, then pulled back by the bars. The thickness and number of the bars is selected with respect to the inertia of the feeder so that the power impulses will be applied at the natural frequency of the vibrating system. The action is not so much a throwing of the load as a pulling of the trough downward and backward, leaving the load momentarily suspended in space. It then falls vertically, landing slightly (up to  $\frac{1}{4}$  in.) ahead of its earlier position. The effect is almost continuous flow, much like a fluid. And like a fluid, its flow can be increased by sloping the trough a few degrees toward the discharge.

Vibrating feeders come in many designs with chutes, tubular conveying sections and grizzly decks. The material level is controlled by an adjustable gate and the delivery rate by a rheostat or other manual controller to control the amplitude. Largest sizes range upward to as high as 2,000 tons per hr. Any given feeder can be instantly adjusted to any rate from a trickle to full capacity. Depending on the type of power supply available, and the size of the feeder, units may operate direct, from a motor-generator, or from a selenium rectifier.

Vibrating feeders are an extremely versatile type, capable of handling materials at temperatures as high as 1,000 deg. F.—without special cooling of the magnet provided the ambient is under 200 deg. F. The conveying action is said largely to avoid effects of abrasion, while corrosion can easily be handled by special chute materials. For bad conditions the magnet is sealed and sometimes cooled and the springs packed in grease. Sticky materials are sometimes handled by putting strip heaters on the trough bottom. However, a vibrating feeder cannot handle materials that flood, unless an anti-flooding feeder such as a star is used ahead of it. Typical installations of vibrating feeders appear in Figs. 7 and 8.

**Electrical vibrating feeders**

**Vibrating feeder variations**

**Vibrating feeder is versatile**



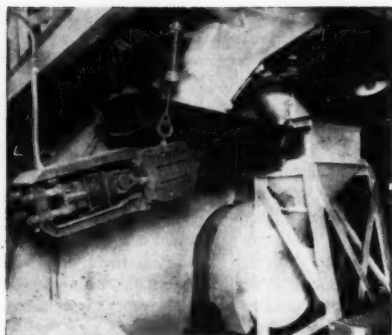


Fig. 7—Jeffrey-Traylor electric vibrating feeder on a cement ball mill.

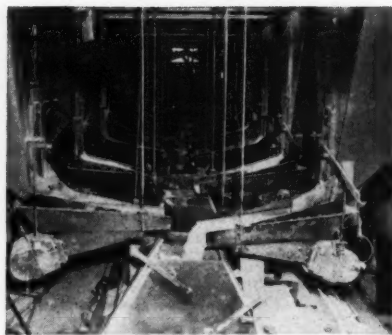


Fig. 8-14 Syntron electric vibrating feeders in a refractories plant.

**What feeder to use**

Link-Belt Co.'s recommendations regarding use of feeders of the various types discussed above may be summarized as follows: For fine, free-flowing materials use two-chain bar-flight; belt; screw; rotary-pocket; or vibrating feeders. For non-abrasive and granular materials containing some lumps, use apron; bar-flight; belt; vibrating; reciprocating-plate; rotating-table; or screw feeders. For materials that are difficult owing to heat, abrasion, lumpiness or stringiness, use apron; bar-flight; belt; vibrating; or reciprocating-plate feeders. For heavy, lumpy, abrasive materials such as mine-run ores, use apron; mechanical-vibrating; or reciprocating-plate feeders.

**Fluidized feeders**

Interest in the handling of solids in a fluidized condition in recent years has catalyzed the development of fluidized feeders. Fig. 9a shows a fluid feeder for powdered coal developed by the U. S. Bureau of Mines in connection with its synthesis-gas-from-coal program at Morgantown, W. Va. This feeder, operating at pressures up to 450 psig., is charged with up to 4,000 lb. of coal which is then fluidized by a small flow of inert gas. The gas is de-dusted by a centrifugal separator and knock-out separator and recycled by a compressor. Make-up gas is added to replace the gas withdrawn with the coal. Fluidized coal enters a funnel opening upward and flows to the process through a coil used to control the feed rate. Pressure drop across the coil is a measure of flow rate. The feeder vessel, 36 in. in diameter and 36 ft. high, handles from 200 to 700 lb. of coal per hr. at a fluidized density of about 20 lb. per cu. ft., using a superficial gas velocity of 0.1 to 0.2 fps. in the fluid bed. Consumption of inert gas is about 2 percent of the gas made in the synthesis system.

**Fuller-Kinyon pump**

One of the oldest applications of fluidization is the Fuller-Kinyon solids pump (Fuller Co.) diagrammed in Fig. 9b. It uses air pressures up to about 35 psig., and can discharge against pressures up to about 20 psig. Although intended mainly as a conveyor, it can be used as a fluidized feeder for fine materials under suitable

circumstances. The pump uses a screw conveyor operating full to feed the fluidizing section and seal against back-blow. The seal is improved by decreasing the screw pitch toward the discharge to give a choke-screw effect. Near the end of the screw air is injected by means of an air ring and this air, expanding, conducts the material through the pipe in a dense fluidized condition. This pump operates on a much smaller air-to-material-volume ratio than do pneumatic conveyors.

**Airslide conveyor**

Another fluidized-material conveyor which is used chiefly in transport but offers some possibilities as a feeder under suitable conditions is the Fuller-Huron Airslide, a trough having an air-permeable bottom with a wind-box below it (Fig. 9c). Fluidizable material in the trough is fluidized by the air and will then flow by gravity down the trough if sloped at 3 to 6 deg.

Feed in fluid-catalyst cracking systems is simply accomplished by entraining the solids in a gas or vapor stream which can then be controlled by slide valves. Control of circulation between vessels is obtained by the use of "hydraulic legs" and by the adjustment of the difference in the fluidized densities between two connected legs. In the Dorco Fluosolids system the feeding method varies with the feed consistency. Wet feeds too stiff to pump are diluted to pumpable consistency. Dry feeds are handled by conventional screws (fine materials), table feeders (coarse materials), or electric vibrators (intermediate and coarse materials) which are enclosed and operated under sufficient pressure to balance the slight pressure of the fluidized system.

**Airlocks for pressure**

There are a number of other volumetric feeding and removing methods which are not readily classified. Fig. 9d suggests one variation of the commonest method of feeding materials into a pressure or vacuum zone. Material is charged into one of two air-tight bins at atmospheric pressure, while the second bin is pressurized the same as the process. It is fed continuously from the pressurized bin through a rotary-pocket feeder having a casing and shaft packing designed

for the pressure used. There need be no differential across the drum itself. Sometimes the feeder itself is placed inside a pressure feed vessel, in which case almost any kind of feeder can be used since the entire feeder is at the same pressure.

**Choke-screw seals** A screw conveyor with a decreasing pitch toward the discharge, fitted closely to a conveying tube, is sometimes used for delivery against moderate pressure or vacuum. It has already been mentioned as a component of the Fuller-Kinyon pump. Except in that application such a choke screw usually delivers against some form of spring-loaded valve plate. A difficulty with this method is that the screw may jam if the plug of material has any tendency to set up.

Fig. 9e shows an adaptation of the airlock idea which is used by Airborne Conveyors Corp. for removing flowable material from pneumatic handling systems operated under either pressure or vacuum. The device employs two flexible pneumatic sleeve valves with a surge volume between, and a pressure control system which alternately opens one valve after having closed the other. With the bottom valve closed, the upper one opens to admit material to the surge space. The upper valve then closes, the lower one opens and discharges, and the cycle repeats. A similar double-valve system is often used for charging pressure equipment such as blast furnaces.

**Spreader feeders** Sometimes it is desired to feed material uniformly across a wide surface, for example, a wide belt conveyor, or the belt of a wide continuous dryer. Proctor & Schwartz makes a novel spreader to suit some of its drying problems. Shown in Fig. 10, the feeder consists of a belt conveyor mounted as a boom and pivoted at the feed end. The boom is hydraulically oscillated back and forth horizontally in a fixed cycle, feeding material uniformly across the dryer belt. Electric vibrator feeder manufacturers offer another form of spreader, consisting of a standard vibrating

feeder with either a diagonal slot cut in the trough, or with the trough cut off diagonally. When the feeder is mounted over the receiving belt and at right angles to it, the feeder discharges uniformly along the diagonal.

Still another device related to feeders is the **Stream dividers** of Fig. 9f, produced by Great Western Mfg. Co. If material is supplied at a uniform rate to the central rotating feed spout, then the latter in its rotation will distribute uniformly to the 3 to 12 hoppers below it.

### Gravimetric Solids Feeders

Feeders which deliver solids at a constant predetermined weight are made in a considerable number of designs, but all operate on one of three main principles. The continuous types feed on to a weigh belt, that is a short belt conveyor which is supported by a scale. Since the belt operates at a constant speed, the delivery will be constant as long as the belt loading is uniform and constant. The scale therefore operates to maintain a constant feed to the belt, decreasing the feed if the load is too great, increasing if it falls below. The main differences between various weigh-belt feeders lie in the methods of adjusting the feed rate.

Semi-continuous weighing feeders usually feed into a weigh hopper which cuts off and discharges when a certain load has been reached. Still another type weighs out of a scale-balanced hopper. This so-called loss-in-weight method is continuous except when it is necessary to recharge the feed hopper.

Among the weigh-belt types are feeders using screws, vibrators, adjustable gates and feed belts as the means of controlling feed to the weigh belt. Fig. 11a diagrams the method of operation of the Merchen feeder (Wallace & Tiernan Co.) in which a pair of variable-speed spirals of twisted rod act as feed screws. The weigh belt is supported at both ends by a "dead" section and at

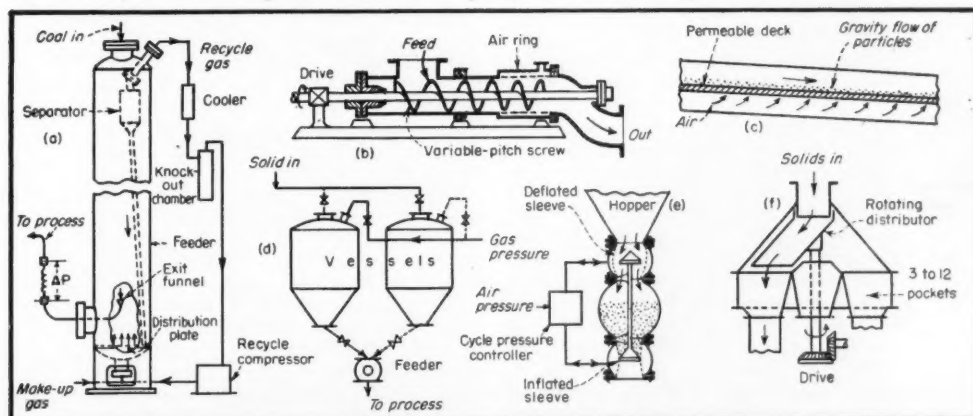


Fig. 9—(a) Bureau of Mines fluidized coal feeder for 450 psig.; (b) Fuller-Kinyon solids pump; (c) Fuller-Huron Airslide conveyor; (d) twin airlocks for pressure feeding; (e) Airborne Flexlock discharger; (f) Great Western stream divider.

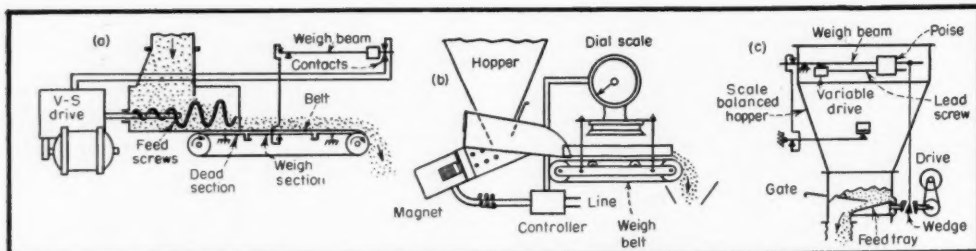


Fig. 11—(a) W & T Merchen weigh-belt feeder; (b) typical vibrator-fed weigh-belt feeder; (c) Omega loss-in-weight feeder.

its center by a short scale-balanced section. The dead section at the discharge prevents variations in angle of repose from affecting the weighing. The scale automatically corrects the speed of the conveyor screws to hold a constant weight and compensate for any density variations.

**Vibrator-fed weigh feeder**

Vibrating weigh feeders may be explained in connection with Fig. 11b. Weight on the weigh belt is used to adjust the feeder amplitude automatically to maintain a constant belt load. Fig. 12 shows a Syntro weigh feeder of this type in which the entire weight of the belt is carried on a scale. Supporting one end only on the scale is another method.

**Gate-controlled feeders**

Several weigh feeders use the belt to pull material from the feed hopper, controlling the amount withdrawn by the position of a gate. In some the balance position of the belt itself serves to weigh the load and adjust the gate. The Hardinge feeder, Fig. 13, is of this type. In others the gate position is adjusted under control of the scale by means of a servo. Richardson Scale Co. makes one type (Fig. 14) in which the feed is handled by one belt and the weighing by another. The weigh belt runs continuously and the feed belt intermittently. The feed belt runs long enough to feed a predetermined weight on to the weigh belt, then stops. As soon as the weigh belt has discharged a part of its load, the feed starts again and the cycle continues. This results in continuous discharge for a time, followed by a short interval between weighed loads. The particular machine shown is a heavy-duty type for 400 deg. F. cement clinker handled at 45 tons per hr. Both conveyors are equipped with steel aprons. Feeders of this type can be made exceptionally accurate.

**Anti-flood feeders**

Weight feeding of materials which tend to flood requires an anti-flooding device such as a rotary-pocket (star) feeder between the bin and the feeder for the belt. Omega Machine Co. makes such a feeder, combining a star wheel with a mechanical vibrator and belt feeder. Richardson Scale Co. uses a star wheel in conjunction with a pair of elevating feed screws. In neither case, however, is the star wheel used as the controller of material flow to the weighing section, since it is impossible to get instantaneous cut-off with a star wheel.

Ordinarily a higher degree of weighing accu-

racy is possible with weigh feeders of the type weighing into a hopper. Such feeders use belts, screws and vibrators as the means of feeding the hopper. Usually the last of the load is dribbled in, after which the feed stops, the hopper discharges automatically, and the cycle repeats. Such a scale, of the vibrating feeder type (Jeffrey-Traylor), appears in Fig. 15. A variation of the weigh hopper method which feeds continuously as long as the hopper contains material is the loss-in-weight feeder of Omega Machine Co., shown diagrammatically in Fig. 11c. Here a feed hopper supported by a scale mechanism is emptied by a mechanical vibrator at a predetermined rate. The scale poise is retracted at the desired rate by a lead screw driven by a variable-speed drive. It is therefore the task of the vibrator to withdraw material at such a rate as to keep the scale continuously in balance. This is done by adjusting the amplitude of the vibrator in a very simple manner, by means of a resilient wedge suspended from the scale beam between the vibrator and its reciprocating drive. If the feeder lags, the beam rises, the wedge lifts, and the amplitude increases. Such a feeder has a 100 to 1 range of feed rate and an accuracy within 1 percent by weight.

**Hopper-weigh feeders**

**Loss-in-weight feeders**

### Solids Feeding Problems

Solutions to some of the problems in solids feeding have already been mentioned. In general these problems fall under the headings of bin hang-up ahead of the feeder (dealt with in a later section); flooding and flushing; movement against pressure and vacuum; sticking of material to bin or feeder parts; and problems of temperature, corrosion and erosion.

**When troubles come**

Some fine materials, portland cement for example, aerate readily and flow like a liquid. Indeed, with such materials it is difficult to keep joints tight enough to avoid leakage. Feeding therefore requires a feeder which either depends on the fluidizable property of the material (Figs. 9a to c), or is able to prevent flow-through (Fig. 5a to e). Allis-Chalmers Mfg. Co. makes an anti-flooding screw feeder in which spring-loaded wooden blocks ride on top of the screw flight. Fig. 16 shows the Stephens-Adamson antiflooding bin-discharger-feeder diagrammed in Fig. 5e. Fig. 17 shows an antiflooding scale-hopper feeder

manufactured by Richardson Scale Co., and mentioned above in connection with the use of a star wheel. This feeder has been used successfully on 7-micron silica and ferrochrome ore. The twin choke-screw feeders are closed off the instant they stop by rubber-gasketed disks which are forced against their ends by air pressure. In addition, the screws reverse momentarily when the hopper weight has been attained, as a further precaution against material spilling into the hopper after cut-off.

**Pressure  
and  
vacuum**

One of the most difficult feeding problems is to feed solids and semi-solids against pressure or vacuum. The usual star feeders are suitable for low pressures of a few pounds but none is recommended for differentials of more than about 15 psig. One manufacturer has been experimenting with a special flight conveyor in which the flights are sealed by passing through a resilient-walled section of the duct. The methods of putting the feeder into a pressure vessel, or putting the feed under pressure, have been mentioned and will suffice in many cases. Fluidizable materials can sometimes be handled as a fluid against considerable pressure, as with the Bureau of Mines feeder (Fig. 9a).

**LDC  
coal  
pump**

A new solution, which is still under development by the Locomotive Development Committee of Bituminous Coal Research, Inc., is shown in the phantom view of Fig. 18. Known as the

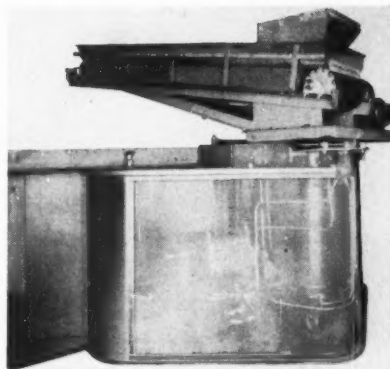


Fig. 10—Proctor oscillating feeder for dryers.

coal pump, this specialized rotary-pocket feeder was developed to feed pulverized coal continuously to the LDC experimental coal-burning locomotive gas turbine. Normally it feeds against about 75 psig, but it has handled pressures as high as 140 lb. Earlier models of the pump were built for the LDC by Turbodyne Corp., and later models by Read Standard Corp. It should be emphasized that the pump is not on the market and there are no definite plans for marketing it, although it will probably be licensed for

**Not yet  
on the  
market**

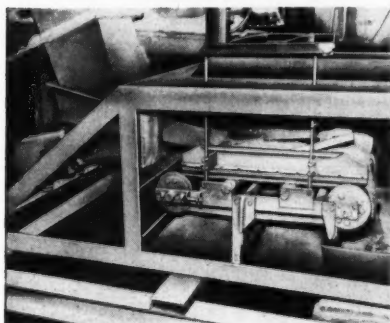


Fig. 12—Syntron vibrator-fed weigh-belt feeder.

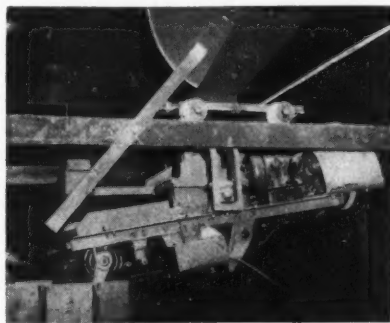


Fig. 13—Hardinge gate-controlled weigh feeder.

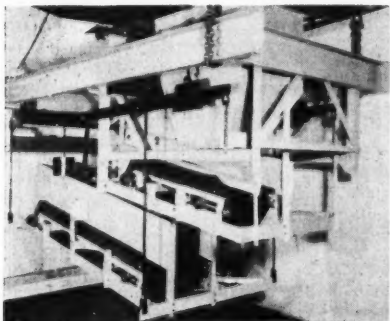


Fig. 14—Richardson two-belt weigh feeder.

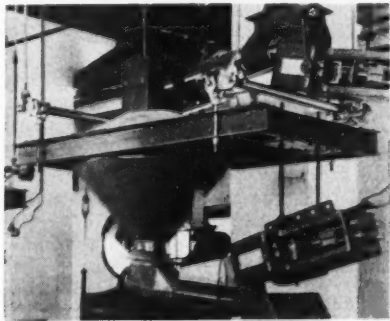


Fig. 15—Jeffrey-Trailor batch weigh hopper.

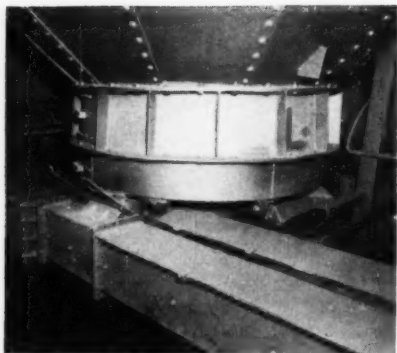


Fig. 16—Stephens-Adamson two-stage discharger.

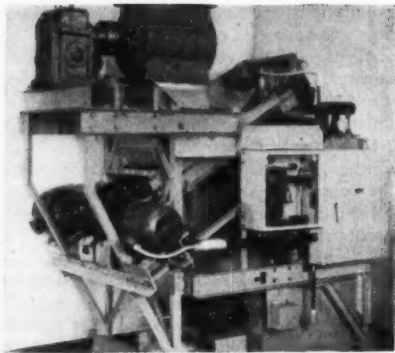


Fig. 17—Richardson anti-flood weigh hopper.

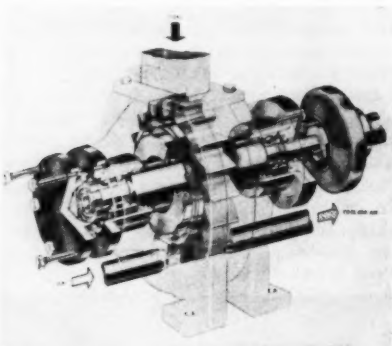


Fig. 18—LDC coal pump for 75 psig. pressure.

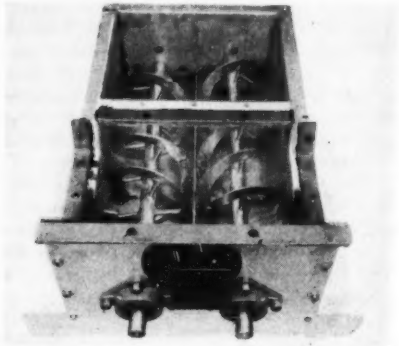


Fig. 19—Richardson sticky-material feeder.

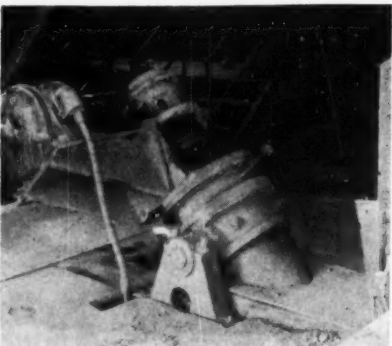


Fig. 20—Oliver screw feeder for cement kilns.

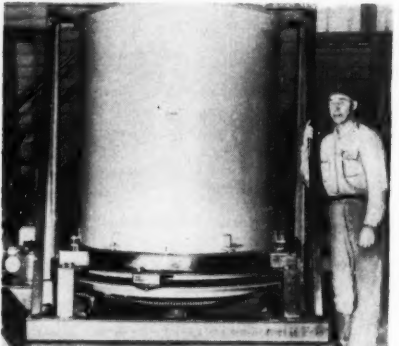


Fig. 21—Com-Bin feeder for sticky chemical mixture.

commercial manufacture after development is completed.

**How it works**

The pump consists of a multi-pocket rotor mounted on a heavy shaft carried in outboard bearings. Feed is at the top, with discharge at the bottom by means of a blast of high-pressure air. The pockets are vented of their high-pressure air as they reach a position of about "9 o'clock". One of the biggest problems in design

of the pump was the sealing of the sides of the rotor. The seal shown is a U-ring of synthetic rubber carried by the rotor and expanded by oil pressure into an annular groove in the stator.

The problem of stickiness in substantially dry materials can often be solved as with the semi-solids feeders described below; by running certain sorts of feeders such as screws at above-normal speeds; by improving bin discharge as

**What to do about stickiness**



described below; or by adding scrapers of various sorts to existing feeders. For instance, Omega Machine Co.'s rotary-pocket feeder has a spring-loaded scraper which scrapes out each pocket as it passes through the discharge zone. Wyssmont Co. has modified feeders of this type to use a positively driven rotary scraper synchronized with the movement of the drum.

**... Or high temperature** Most feeders except those using a rubber or fabric belt are inherently capable of handling fairly high temperatures. Feeders without close clearance, such as the vibrators, apron, plate and disk feeders, are most readily used under high temperature conditions. Similarly, all-metal feeders in general are most easily adapted to severe corrosive conditions. Vibrating feeders inherently suffer little from erosion. Manganese steel is often used in other types where heavy loads and severe erosion are both problems.

### Semi-Solids Feeders

**To lick semi-solids:** Pasty, wet and semi-solid mixtures which are too stiff for handling in conventional pumps often introduce some of the greatest feeding difficulties. Solutions generally lie in using conventional solids feeders or in modifying them; in using certain special types of pumps or extruders; or in modifying the material in some way so as to make it handleable.

**Use screws, or ...** Among the more conventional feeders, the screw seems to find considerable use, either in the usual solid form or as a ribbon flight. Fig. 19 shows such a feeder, used by Richardson Scale Co. as part of a bagging system for such extremely sticky materials as molasses feed. Both solid-flight and ribbon screws are sometimes used for feeding filter cake, for instance the Oliver United Filters screw feeder shown in Fig. 20, feeding a cement kiln. For many sticky materials the ribbon flight is better since it helps to avoid filling up around the shaft. In some cases interrupted screw-flights or double-shaft feeders with paddles (as in a pug mill) have been effective on sticky masses. Again, rotary-pocket feeders with automatic pocket scrapers have been successful in some applications.

**The Com-Bin, or ...** One of the most promising sticky-materials feeders is the Pulva Com-Bin (Fig. 21 and the frontispiece), already explained in Fig. 1h. Except for the fact that it cannot feed against pressure or vacuum, it seems to be relatively unlimited in its ability to handle either non-flooding dry materials or sticky semi-solids. This feeder, developed about two years ago at Stabilized Pigments, Inc., Piscataway Township, N. J., is now in use on such materials as damp copperas (as in the frontispiece); a minus 200-mesh iron ore concentrate containing 10 percent moisture; a chemical salt containing oil and moisture; a pharmaceutical centrifugal cake; a light, waxy powder; a flake chemical soil conditioner. Units are being built to handle benzene hexachloride containing 10-12 percent methanol,

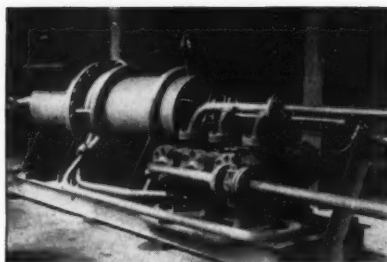


Fig. 22—Meader "pump" for clayey masses.

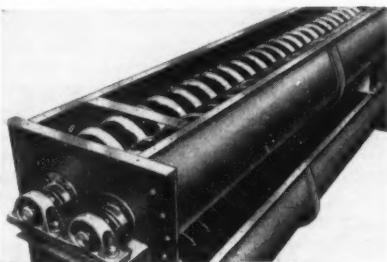


Fig. 23—Holo-Flite dryer for sticky products.

and triple superphosphate. Materials tested successfully have included putty and caulking compounds, a variety of sticky filter cakes, lead oxide paste for batteries, and starch with up to 48 percent moisture, to mention only a few.

This feeder, of course, cannot handle materials that flow through, since it is like the table feeder in this respect. About the only other limitation recognized at present is size, since the entire bin must rotate. However, a 75-ton per hr. feeder (for superphosphate) is under construction and a larger one of 100 tons storage capacity—11 ft. diameter by 16 ft. in height—is projected.

Pumps and extruders for feeding semi-solids are relatively unusual but offer a solution in special cases. The recently developed Meader pump, manufactured by Henry Balfour & Co. Ltd., Leven, Fife, Scotland, is a case in point. It handles thick, clayey materials that are normally unpumpable, pushing the material as a solid column through pipelines up to 1,000 ft. or more in length. The pump operates by hydraulic pressure, using an ingenious method of first trapping a quantity of the material to be pumped within a cylinder which is pushed hydraulically through the material in a hopper. A piston then expells the material from the cylinder into the pipe line. An automatic valve gear, shown in the foreground in Fig. 22, controls the cycle of operation of the cutting cylinder and piston.

Provided they are non-abrasive, plastic materials with apparent viscosities as high as 2,000,000 SSU have been handled successfully by gear pumps, according to Worthington Corp. This

Perhaps an extruder

... Or a pump



Fig. 24—Pre-forms for Proctor dryers from: (left) Fin-Drum pre-dryer; (center) filter cake scorer; (right) rolling extruder.

appears to offer an opportunity for the feeding of some nearly solid materials which normally would be considered unpumpable.

Moyno  
positive  
pump

Another type of pump capable of handling unflowable materials such as tooth paste, soap stock, putty, plaster, highly viscous food products and similar substances is the Moyno pump produced in this country by Robbins & Myers Inc. Abrasives cause no difficulty. As a general rule the pump will discharge any material which can be fed to it under the approximately 29 in. of vacuum it is said to be able to pull. The pump is a positive one of most unusual construction, almost incapable of description. Suffice it to say that it uses a long helical-screw rotor, revolving in a resilient stator with a double-helical passage. Despite complex geometry, it is actually a simple pump with but a single moving part.

Modify the  
consistency

When other methods fail in the feeding of semi-solids, there are often ways of modifying the consistency or character of the material so that it can be fed satisfactorily. In some drying processes, for example flash dryers, the feed material is sometimes mixed with already dried material to give a suitable consistency. In processes where additional liquid will not be harmful, a sticky, difficult-to-feed material can often be diluted and introduced by a conventional type of pump, for instance, a diaphragm pump. At the other extreme, in some cases a sticky material can be partially dried or even completely dried before feeding to the next step. Fig. 23 shows the Holo-Flite Processor, produced by Western Precipitation Corp., which uses hollow heated (or

cooled) screw flights for heat transfer and can be employed for either partial or complete drying. One informant—not the manufacturer—has stated that he has never found a material with properties so bad that it could not be handled smoothly in this combined conveying and heat transfer machine. Apparently the combination of heated surfaces and rubbing action prevents the material from balling up or clogging.

Another approach to partial drying as a method of producing a suitable feed for dryers is found in the Fin-Drum former and pre-dryer that has been used for a number of years by Proctor & Schwartz. This is one of several pre-forming methods used in feeding pasty materials to the company's belt-conveyor continuous dryers. The material is pressed into circumferential grooves in the surface of a heated drum. After a little less than a revolution the preformed sticks—Fig. 24a—are scraped from the grooves on to the dryer belt.

... With a  
pre-dryer

For materials that form a suitable cake on a vacuum filter it is sometimes possible to score the cake on the filter drum to form short sticks when the cake is stripped off by the doctor blade. Fig. 24b shows such sticks, while Fig. 25 shows an Oliver filter equipped with scoring wires. Still another method used by Proctor & Schwartz is to extrude the material into  $\frac{1}{4}$ -in. "worms" of 1 to 3 in. length, as in Fig. 24c. For this purpose Proctor & Schwartz has developed a "rolling extruder" consisting primarily of a curved screen of perforated metal on which a pair of rollers with a feed hopper between them

... Or  
score the  
cake

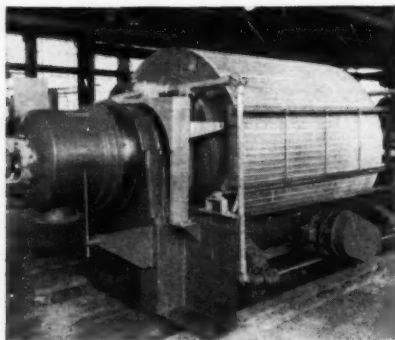


Fig. 25—Oliver vacuum filter with cake scorer.

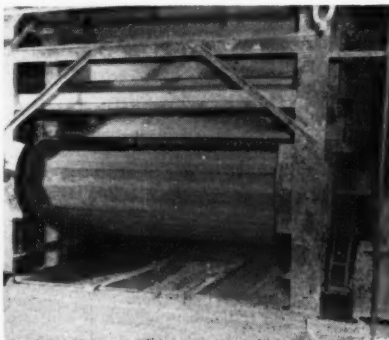


Fig. 26—Proctor rolling extruder feeding dryer.

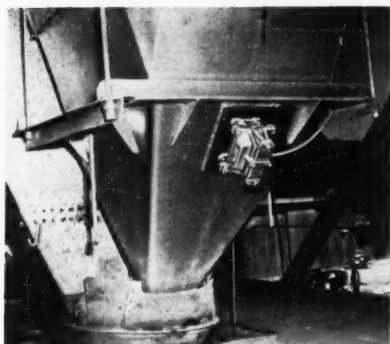


Fig. 28—Syntron bin vibrator on weigh hopper.

oscillates back and forth. Fig. 26 shows a rolling extruder in operation. For less sticky materials a somewhat similar piece of equipment known in the pharmaceutical industry as a granulator can sometimes be used as a feeder and feed conditioner prior to further processing.

### Slurry Feeders

**Thick slurries too** Many slurries, of course, are pumpable with conventional or fairly conventional centrifugal, diaphragm and piston pumps. For example, Milton Roy Pump Co. reports it can handle lime slurries as high as 40 percent in concentration, and liquids up to 30,000 cp. in viscosity, with only slight modification of its conventional proportioning pumps. The Moyno pump also will handle slurries of all kinds. It is also worth mentioning that relatively unpumpable slurries are fed extensively to such equipment as kilns and ball mills by means of rotating scoop and "ferris wheel" feeders which are simply rotating devices which trap a certain quantity from a sump, elevate it, and pour it into the equipment where it is to be treated.

### Bins and Dischargers

**When bins cause trouble** Feeder troubles are often actually bin troubles—since many materials tend to bridge, arch and hang up in bins and hoppers, thus failing to reach the feeder at a uniform rate. Such troubles are solved by the design of the bin itself, by the

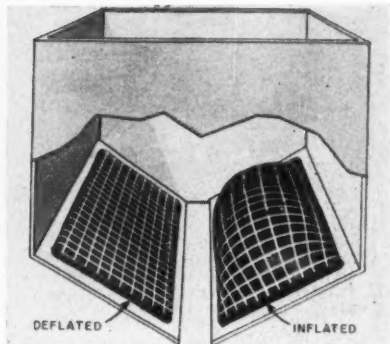


Fig. 29—Gerotor May pulsating-panel discharger.

use of agitators within the bin, by air jetted or diffused into the bin contents, by vibrating or pulsing of the bin walls, and finally by suitable built-in dischargers.

Bin design has been dealt with in a number of standard works, but is still the subject of controversy among those who believe in the use of one or more straight sides all the way down to the discharge, vs. the proponents of full conical or four-sloped hopper bottoms. There is no opportunity here to get into the details of design except to recall the fact that the least slope in a hopper will occur in the valleys between adjacent sides, and that such valleys should generally not have less than a 45-deg. slope. Apart from that, it is well to anticipate that certain materials will tend to hang up almost regardless of bin design, which gives point to the many methods of defeating arching tendencies.

**Bin agitators** Figs. 27a and b show three simple agitators often used to prevent hang-up. Both horizontal rotating and vertical reciprocating agitators are common for the purpose. Omega Machine Co. uses the wall-suspended reciprocating plates of Fig. 27a in many of its feeders. In bins not equipped with mechanical agitators, an air jet is often effective in breaking an arch. Fig. 27c shows an aerating method installed in the bin bottom that has been used successfully by the Locomotive Development Committee in getting pulverized coal out of a bin and into the coal

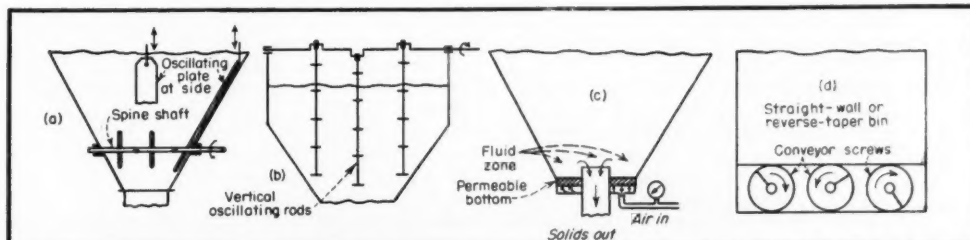


Fig. 27—(a) Vertical-plate and horizontal-shaft bin agitators; (b) vertical reciprocating bin agitator; (c) fluidizing bin bottom to insure discharge; (d) screw-feeder "live bottom" bin discharger.

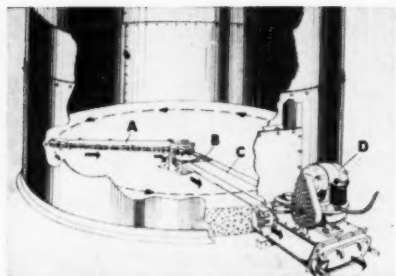


Fig. 30—Smith Harvestore self-discharging glass-lined silo for chemical storage.

feeder. Bin-Dicator Co. is producing fabric-covered air-diffusing panels for mounting on bin walls to aerate material near the discharge point and so make it flowable. Many chemicals are among the materials that can be handled in this fashion.

**Bin-wall vibrators** Both pneumatic and electric bin-wall vibrators are commonly used to prevent arching. In some cases the continuous use of such vibrators has the effect of packing the material, rather than freeing it, and when this happens an occasional fairly strong blow on the bin wall with a pneumatic rapper is preferable. Fig. 28 shows how a Syntrol electromagnetic vibrator is installed on a cement weigh hopper.

**Pulsating rubber panels** Pulsating rubber panels, Fig. 29, installed at suitable points within a bin, are particularly effective in preventing either bridging or funneling. This method was first used about 30 years ago in the mining industry, but it has only recently been put out commercially, by Gerotor May Corp. Panels are produced in sizes up to 2 by 6 ft., for amplitudes up to 12 in. In use the panels are inflated with air, commonly at about 10 psig., then deflated in a suitable cycle, usually 2 to 5 per min. A simple control system which releases when the desired maximum pressure is reached avoids need for complicated cycle controllers. The method has proved effective with all sorts of materials, including those that cake in storage, dry, light and fluffy materials, as well as viscous and pasty materials.

**Built-in discharge devices** Built-in mechanical bin dischargers solve the hang-up problem in many cases. The Stephens-Adamson system (Figs. 5e and 16) has already been mentioned. Quite a new method, known as the Harvestore, has been brought out by A. O. Smith Corp., initially for use in the storage of farm silage. The system has interesting possibilities for process industries storage and for this purpose is handled through Sprout, Waldron & Co. The device consists of an air-tight silo fabricated of rings of glass enameled steel, secured with special bolting and cemented joints. If air is to be excluded the upper portion of the silo is equipped with one or more large plastic "breathing bags" to take care of pressure changes. Joints are lapped in such a way that the silo has

a slight, imperceptible taper, being larger at the bottom so as to facilitate discharge without bridging. At the bottom a special discharger is installed in a trench in the concrete floor.

Dischargers are built so as to be removable readily for repairs, or for use of a single discharger in several silos. The discharger (Fig. 30) is of the chain-and-flight type, with a rotating boom A just above the silo bottom, which digs its way around as it rotates, discharging to the center B where flights moving in a trough beneath plate C carry material to the outside. Motor D drives the entire unit.

Still another discharge method that is favored by Sprout, Waldron and by the Link-Belt Co. is the live-bottom bin suggested in Fig. 27d. Here the idea is to use a bin preferably with straight sides, or even slightly larger at the bottom, and with the entire bottom swept by a parallel group of screws placed about 6 in. apart. Adjacent screws operate in opposite directions. This method has proved effective in some particularly stubborn cases of bridging.

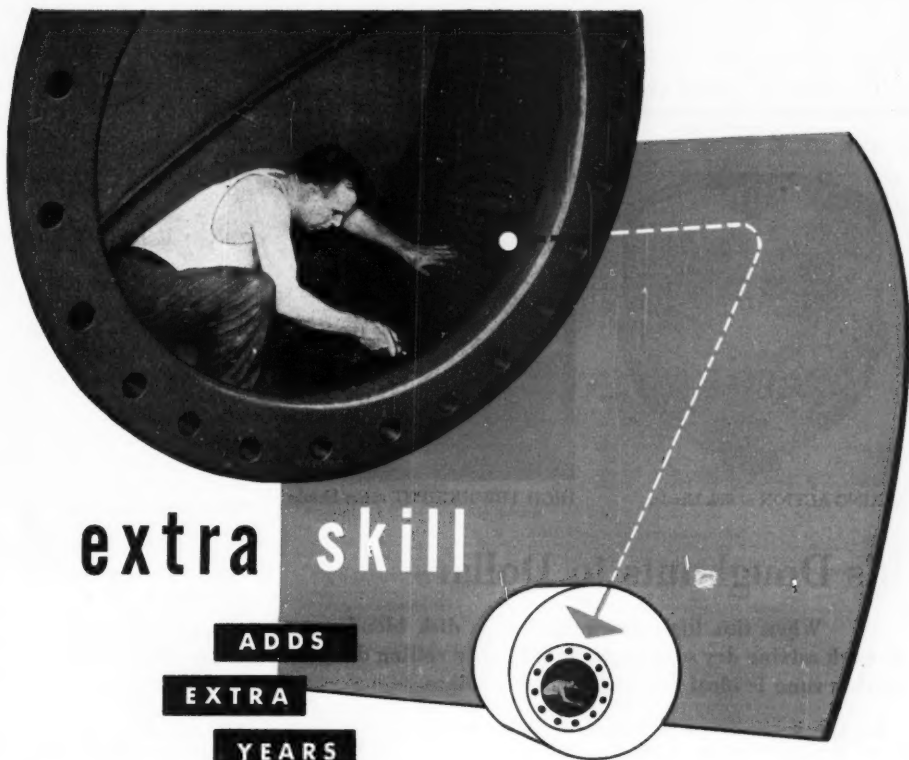
Information for this report came from many different sources. Individuals who collaborated from the "user" standpoint included Charles Fuhrmeister, Jr., of Oliver United Filters; S. B. Kanowitz of Raymond Pulverizer Div., Combustion Engineering Corp.; C. A. Lee of Darling & Co.; F. A. Miller, of Du Pont; J. W. Reinhardt and William Cramer of Proctor & Schwartz Inc.; E. J. Roberts, R. P. Kite and others of the Dorr Co.; L. D. Schmidt, of the Synthesis Gas Branch, U. S. Bureau of Mines; Arnold Weisselberg, of Wyssmont Co.; and J. I. Yellott, of the Locomotive Development Committee, Bituminous Coal Research Inc.

Collaborating companies in the field of feeder, bin discharger and pump manufacture included Airborne Conveyors Corp., New York; Allis-Chalmers Mfg. Co., Milwaukee; Henry Balfour & Co., Ltd., Fife, Scotland; C. O. Bartlett & Snow Mfg. Co., Cleveland; Bin-Dicator Co., Detroit; Fuller Co., Catasauqua, Pa.; Gerotor May Corp., Baltimore; Great Western Mfg. Co., Leavenworth, Kan.; B. F. Gump Co., Chicago; Hardinge Co., York, Pa.; Hewitt-Robins Inc., Robins Conveyors Div., Passaic, N. J.; Improved Paper Machinery Corp., Nashua, N. H.; Jeffrey Mfg. Co., Columbus, Ohio; Link-Belt Co., Chicago; Milton Roy Pump Co., Philadelphia; Omega Machine Co., Providence, R. I.; Pulva Corp., Perth Amboy, N. J.; Read Standard Corp., New York; Richardson Scale Co., Clifton, N. J.; Robbins & Myers Inc., Springfield, Ohio; Ross Screen & Feeder Co., New York; A. O. Smith Corp., Milwaukee; Sprout, Waldron & Co., Muncy, Pa.; Stephens-Adamson Mfg. Co., Aurora, Ill.; Syntrol Co., Homer City, Pa.; Traylor Engineering & Mfg. Co., Allentown, Pa.; Wallace & Tiernan Co., Newark, N. J.; Western Precipitation Corp., Los Angeles; and Worthington Corp., Harrison, N. J.

"Live-bottom" bins

We thank...

And these too



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**ADDS**

**EXTRA**

**YEARS**

The men who put the Ace rubber lining in this steel tank know that acid seeping through a pinhole . . . or a tiny blister . . . may cause needless expense for repairs years from now. They know that the cost of *sure* protection *now* is less than the cost of patching up or scrapping equipment that fails too soon. For that reason they work to the highest standards of perfection and skill.

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ground smooth. The rubber itself — a compound selected specifically for the chemicals *this* tank is to hold — is laboratory-controlled at every step. The lining is two layers deep — soft rubber for firm, resilient bond, with age-proof, corrosion resistant *hard* rubber on top. Seams are wide, carefully rolled down. Fillets get extra protection. Final step is 35,000-volt brush test sensitive enough to spot any unsuspected weakness up to 8 inches away.



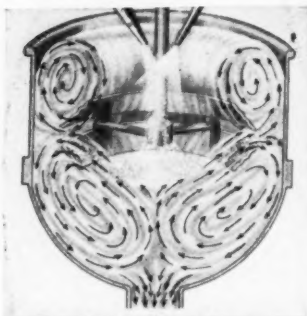
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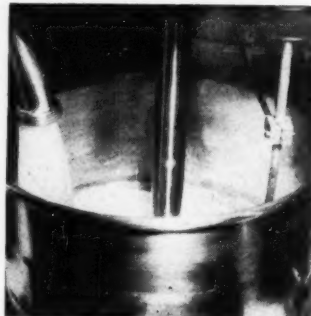
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NEW PROCESSING EQUIPMENT



MIXING ACTION of disk blender.



HIGH THROUGHPUT enters blender.

## It's Doughnuts to Dollars

**When this high throughput twin disk blender goes to work mixing dry solids into liquid. The rolling doughnut mixing zone is ideal for high viscosity mixes.**

Imagine, if you can, mixing cake batter at a 4,000 lb. per hr. rate or mayonnaise at 8,000 lb. per hr. Food production is big volume production requiring continuous high throughput equipment. And production rates of this magnitude are attained with the help of the new AMF twin disk blender.

But let's continue from there because this unit developed for a food industry application shows tell tale signs of being useful on other mixing and blending problems. The reason is it's unusual ability to blend rapidly, thoroughly and continuously those wet and dry materials which produce high viscosity mixtures. The disk blender's particular effectiveness is in the viscosity range starting at the point where ordinary mixer impellers no longer work well and continuing to the limit of pumpability. Actually, the machine will not operate in the lower viscosity range since movement of the blending materials depends largely on the frictional drag between the moving disks and the mix.

Simplicity marks the design of this equipment. The mixing vessel is an open-top round-bottomed bowl fitted with a bottom outlet. A gear pump is close coupled to this outlet to con-

tinuously take away the blended mixture. Mounted over the bowl is the mixer drive motor and from this is suspended the mixer shaft carrying the twin disks. This shaft is tilted slightly to impart the correct mixing action.

Accessory equipment consists of a dry feeder and liquid metering pump. Inside the bowl is suspended a hydro-plane type level control which actuates either a bypass valve on the liquid feed line, the speed of the metering pump and dry feeder or the speed of the gear pump on the discharge line.

Referring to the sketch you can see the nature of the mixing action produced by the twin disk blender. The material in the bowl is divided into two toruses or doughnut shaped rings. Entering material is picked up by the high speed circulation within the rings and rapidly distributed throughout the mass of the mixture. The rapidity of distribution has been demonstrated by noting that a few drops of dye will uniformly color the bowl contents in one or two seconds. Short circuiting is said to be virtually non-existent.

It is felt that the secret of the disk blender's effectiveness lies in the elimination of air accumulation in the low pressure zone. During the development of the unit it was definitely

shown that ordinary impellers operating on high viscosity fluids are fouled by air pockets accumulating in the low pressure areas behind the blades.

A high rate of continuous operation is possible because the symmetrical pattern in the mixing chamber continually covers the outlet opening keeping air from discharge line.

Possible future applications may include the blending or pre-blending of such materials as paint, printing ink, emulsions and plastisols. Currently the twin disk blender is available in 5, 10 and 20 gal. bowl sizes. Motor size varies from 3 to 7.5 hp. The drive is direct connected and rotates at 875 rpm.—American Machine & Foundry Co., 485 Fifth Ave., New York 17, N. Y.

### **Cyclone Separator Cleans Paper Pulp**

The Centri-Cleaner, a cyclone type of separator, is now available to the pulp and paper industry for removal of dirt from fibrous pulps. This device, which is quite similar to the Dutch State Mines cyclone, is said to do an entirely different cleaning job than can be obtained with other similar devices on the market. Fine light impurities such as small bark fragments, pitch and wood dirt are readily removed by this unit, it is said.

This equipment is described in U. S. Patent No. 2,377,524 and Canadian Patent No. 429,584.

Main reason advanced for the claimed superiority of this equipment is that the design of the cone favors higher centrifugal forces than heretofore.—Bauer Bros. Co., 1726 Sheridan Ave., Springfield, Ohio.

### **High-Pressure Reactors Are Titanium Lined**

Reactors for high-pressure research are now available with all internal parts, including the cooling coil, fabricated from pure titanium. Units as large as 9 ft. in length with an I.D. of 6 in. have now been tested.

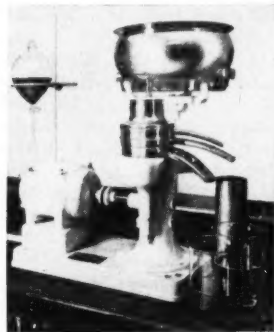
These models are designed for a working pressure of 10,000 psi. at 350 deg. C. Successful tests have been carried out up to 15,000 psi.—Autoclave Engineers, Inc., Erie, Pa.

## Equipment Cost Indexes

(Marshall & Stevens Indexes, 1926 = 100)

Industry	Sept. 1951	June 1952	Sept. 1952
Average of all .....	179.1	180.3	180.5
<b>Process Industries</b>			
Cement mfg. ....	171.5	172.6	172.7
Chemical .....	179.5	181.0	181.1
Clay products .....	166.5	167.6	167.7
Glass mfg. ....	169.6	170.7	171.1
Paint mfg. ....	172.8	174.3	174.4
Paper mfg. ....	173.1	174.6	174.7
Petroleum ind. ....	175.9	177.4	177.8
Rubber ind. ....	178.3	179.8	180.2
Process ind. avg. ....	176.9	178.4	178.6
<b>Related Industries</b>			
Elec. power equip. ....	181.1	182.6	183.0
Mining, milling .....	180.2	181.7	182.1
Refrigerating .....	198.6	200.5	200.9
Steam power .....	168.7	170.3	170.7

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, *Chemical Engineering*, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see *Chemical Engineering*, Feb. 1952, p. 191.



### Laboratory Separator Has Three Bowls

A laboratory model centrifugal separator with three interchangeable bowls provides a high degree of versatility in solving separation problems. The three different bowls are a nozzle bowl for concentration work, a disk bowl for the separation of two liquids, and a chamber bowl for liquid clarification. Alloy steel protected by a tin coating is used in the bowl construction.

Normal operating speed is 12,000 rpm., producing a maximum centrifugal force of 8,800 times gravity at the periphery of the bowl. A  $\frac{1}{4}$ -hp., 1,760 rpm. motor drives the bowl through a worm gearing arrangement. Flow rates as high as 66 gal. per hr. can be handled.—Centrico Inc., 233 Broadway, New York 7, N. Y.

## IN BRIEF—A capsulated listing of this month's newsworthy equipment.

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Combines accuracy and portability	186
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Handles large number of variables	189
Cuts time and unloading cost	190
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### High Production Mill Cuts Processing Time

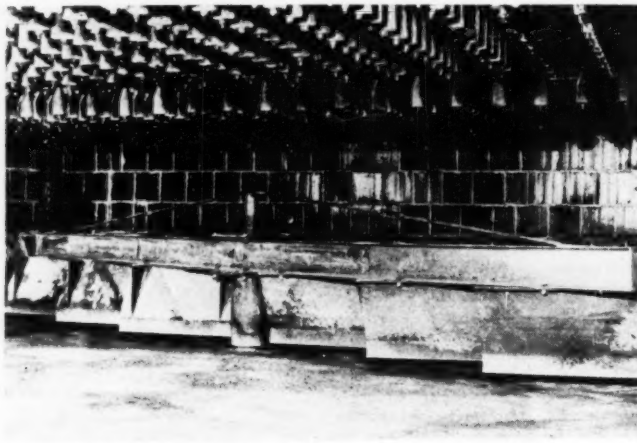
A new line of dispersion mills is said to cut processing time to a minimum, giving a high volume throughput. The equipment is said to be suited for milling, deaeration, and emulsification. Materials ranging from powders to liquids are processed.

Mills are available in either standard cast iron construction or 316 stainless steel. Sizes offered handle capacities ranging from 10 to 1,500 gph.—Morehouse Industries, 1156 San Fernando Rd., Los Angeles 65, Calif.

### Liquid-Liquid Extractor for Pilot Scale Work

The Luwesta three-stage centrifugal extractor is now available in a pilot scale size. This unit, Model EG-2006, handles through-puts up to 4 gpm.

Constructed of 316 stainless steel, the machine has a bowl diameter of approximately 12 in. and rotates at 6,000 rpm. Both feed and discharge are through the top of the machine. Drive is by a 10-hp. explosion-proof motor. The bowl has a retention capacity for solids of 1.5 gal. Approximate cost is \$10,000 without motor.—Centrico, Inc., 233 Broadway, New York, N. Y.



WET BOTTOM of Cottrell precipitator showing agitator arm and paddles.

## Precipitator Has Wet Bottom

**Circulating soda pulp black liquor serves to carry recovered sodium salts from a Cottrell precipitator back to the recovery furnaces. Standard auxiliaries are eliminated.**

In the paper industry Cottrell precipitators have been recovering sodium salts from black liquor furnace gases for many years. Now a new wrinkle cuts time and cost in returning the collected solids back to the process. Strong black liquor coming from the evaporators is circulated through the bottom of the precipitator to pick up the collected dust and carry it back to the recovery furnace.

The old method for handling this dust was to collect it in a hopper under the precipitator. A screw conveyor then carried it to the dissolving tank receiving smelt from the furnace.

The inherent disadvantage of this system has always been that the sodium salt would pick up sufficient moisture to make it plug in the hopper and conveyor. To overcome such plugging it has been common practice to use steam jackets, heating coils and insulation. Also vibrators installed on the hopper prevented build-up at this point.

The newly devised wet handling procedure does away with all this auxiliary equipment. Savings on initial investment and servicing are realized. There is no hold-up of dust

before it is returned to the furnace and operating inconvenience is reduced.

In detail the wet bottom consists of a sump or tank located in the bottom of the precipitator below the electrodes. Black liquor flowing into this sump is maintained automatically at a depth of one foot. Dust rapped from the electrodes falls into the sump where it is kept in suspension by a motor driven agitator. Overflow from the sump is pumped to the furnace. It is said that the degree of agitation is sufficient to prevent any solids build-up in the bottom of the sump.—Research Corp., Bound Brook, N. J.

### Shut Off Valve Actuated by Excess Flow

Instantaneous shut-off of pipe line flow is affected by a new shut-off valve which permits free process flow at normal pressures, but actuates to stop flow the instant regular flow rates are exceeded. This is said to greatly increase the safety factor in handling hazardous chemicals and liquified gases.

The valve is held open by a mechanical linkage connected to a pres-

sure balanced diaphragm. Opposite sides of the diaphragm are piped to pressure taps either side of an orifice mounted in the line. A change in pressure conditions due to increased flow rate moves the diaphragm and connecting mechanical linkage thereby releasing the check valve.

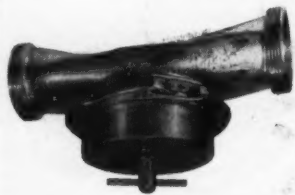
Installation is similar to that of any conventional fitting of the same size. Normal and emergency flow controls may be extensively adjusted by the use of various orifice sizes and diaphragm spring adjustments.—McRae Valve Corp., 621 S. Spring St., Los Angeles 14, Calif.

### Refinery Pump Eliminates Shaft Leakage

The Cameron mechanical shaft seal, previously offered as optional on Ingersoll-Rand pumps, has now been designed into the Class SFLA pumps as standard equipment. After twenty years of development and field experience with this shaft seal the manufacturers claim that it eliminates leakage and stuffing box maintenance.

Use of this shaft seal is said to reduce over-all shaft length, decreasing shaft overhang, giving increased rigidity and strength to the rotating element. Adequate provision for flushing and draining of the seal give lengthened seal life.

Available pump sizes from 1 to 4 in. give capacities to 1,000 gpm. and pressures to 600 psi.—Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

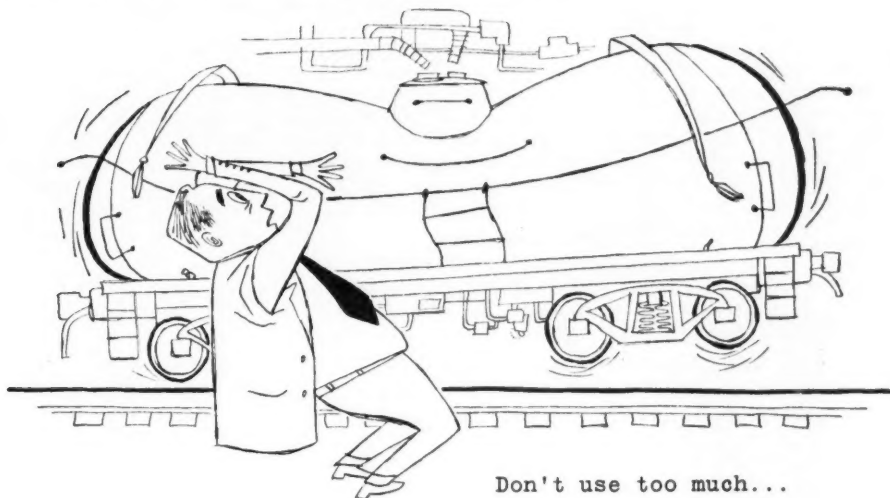


### Magnetic Trap Arrests Tramp Metal

A newly-designed magnetic trap is said to have increased trapping action and be non-agitating to product in process line. As seen above the trap body design is flattened over the magnet producing a greater area to aid trapping action.

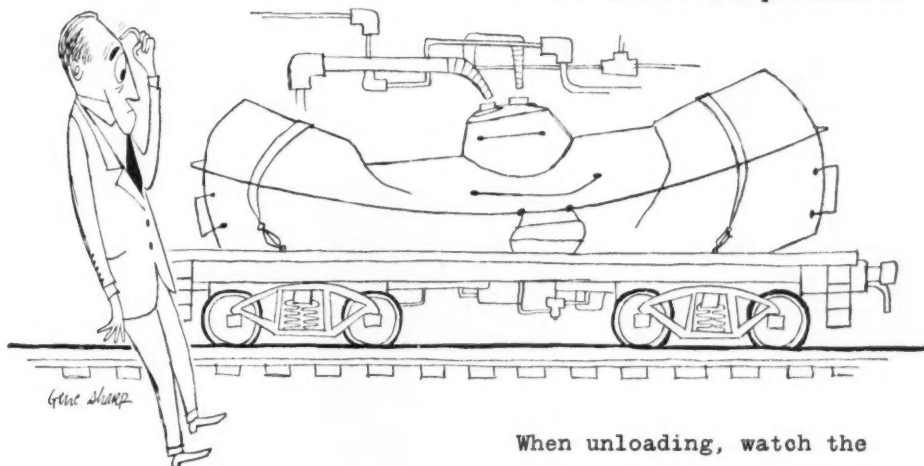
Heart of trap is a grid-type magnet having four or six pie shaped segments

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When unloading, watch the  
vacuum and air pressure.

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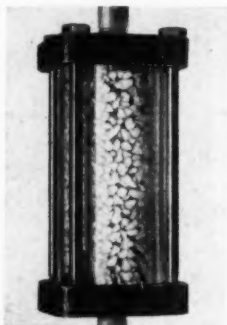


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depending upon trap size. This construction offers four or six gaps across which material can be trapped. Additional trapping occurs across center of magnet in any direction.

Traps are fabricated of Type 316 stainless steel, polished or unpolished; 2, 3 and 4-in. O.D. sizes are available with a choice of Acme sanitary threads, Van Stone ends or IPS screwed ends.—*Tri-Clover Machine Co., Kenosha, Wis.*



**Pipeline Indicator  
Detects Moisture**

The detection of moisture in pipeline is the function of the recently announced air-line moisture indicator. Moisture-sensitive blue granules encased in a Pyrex glass cylinder turn pink when the gas or air flow contains moisture or water vapor.

Metal end plates tapped for  $\frac{1}{4}$  in. pipe allow the glass cylinder to be mounted directly in the pipeline. Four tie-rods connecting the end plates protect the cylinder against damage and permit disassembly for recharging with dry granules. Overall dimensions are 5 in. long by  $2\frac{5}{16}$  in. square. Pressure drop is less than 1 in. of water at 5 cfm.—*King Engineering Corp., Ann Arbor, Mich.*

#### **Throttling Valve Has O-Ring Shutoff**

The Throttling valve features a new design adapting the use of O rings for positive shutoff. Construction is such that the O rings are always fully protected and cannot be blown off provided the valve is correctly installed in relation to line flow. Valve closing is carried out without turning the ring, thereby preventing injury by cutting or wearing. The valve stem is micro adjusting from the fully

open position to less than 1 percent of the total open flow area.

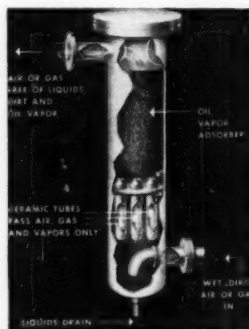
This valve is available in  $\frac{1}{4}$  and  $\frac{1}{2}$ -in. sizes, globe or angle type. Fluid, gas, air or vapor can be controlled up to 3,000 psi. at temperatures from 40 to 225 deg. F. Valve parts are constructed of stainless steel.—*Daniel Orifice Fitting Co., 3346 Union Pacific Ave., Los Angeles, Calif.*

#### **Solenoid Valve Has Wide Adaptability**

The new Model 67 solenoid valve offered in two body styles and with two types of needle and seat construction has been designed for an unusually wide range of applications.

Where positive seal-off is required, the valve is furnished with a synthetic resilient disk type needle seating against a stainless steel orifice. For other applications a stainless steel needle is used in combination with a high strength corrosion-resistant stainless steel valve seat.

Available in two body styles,  $\frac{3}{8}$ -in. female pipe or  $\frac{1}{2}$ -in. O.D. sweat connections, the valve can be used on a wide variety of non-corrosive liquids and gases. Capacity on water is 70 gph. at working pressures up to 300 psi.—*A. P. Controls Corp.*



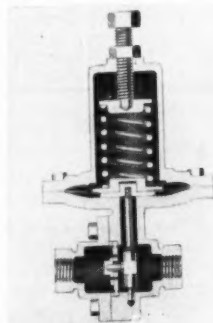
**Adsorption Unit  
Purges Air of Oil Vapor**

Compressed air and gas contaminated by petroleum vapor has remained an industry-wide problem. Now being offered as a solution to this problem is the Vape-Sorber. This device not only purges air or gas of petroleum vapor, but also removes water, water vapor, liquid oil, water-oil emulsion and dirt.

Dirty air or gas entering the bottom of the unit passes up through ceramic filter tubes, which hold back the pas-

sage of all material other than the air or gas and oil vapor. In the upper part of the chamber is a bed of specially compounded activated carbon which removes all petroleum vapor. The gas stream discharging from the top of the unit is completely clean and free of all contaminants.

These units are designed to handle from 100 to 500 cfm. at pressures up to 150 psi.—*Selas Corporation of America, 548 E. Erie Ave. and D St., Philadelphia 34, Pa.*



**Pressure Reducing Valve  
Has Sliding Gate**

An automatic pressure-reducing valve said to be different in principle and design from any other on the market has been recently developed. Severe tests prove it dependable for long-life and trouble-free service.

The outstanding feature of the valve, which makes it different from ordinary globe throttling valve design is a patented sliding gate. This gate, made of stainless steel, operates vertically against a stainless steel plate. Orifices or openings in the plate provide a straight through flow. As the gate slides up and down the face of the plate it creates a wiping action, making the valve self-cleaning. Tight shut-off or dead end service is always assured.

The valve body is constructed of bronze and the diaphragm is phosphor bronze. There are no packing glands or valve seats to regrind.

Available valve sizes range from  $\frac{1}{4}$  to 2 in. Valve is rated 150 lb. W.S.P. at a maximum steam temperature of 400 deg. F. Inlet pressure for water or air service can range up to 250 lb., and the valve will provide reduced pressure as low as 2 lb.—*Jordan Regulator Corp., 109 W. Mulberry St., Lebanon, Ohio.*



# why CRANE 600-pound small steel gates are sure to meet your needs

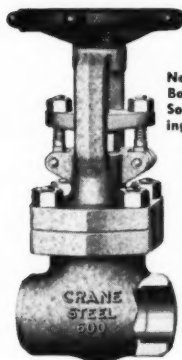
You can't top these Crane Small Steel Gates for dependable performance on high pressure, high temperature lines... for ease of operation... for simplified maintenance. That's because they include design features normally found only in larger or more expensive valves.

Then too, these Crane valves are available in a choice of types to meet your particular requirements. For example, with union or bolted bonnets; with screwed, flanged, or socket-welding ends; and in trim materials recommended for all common fluids.

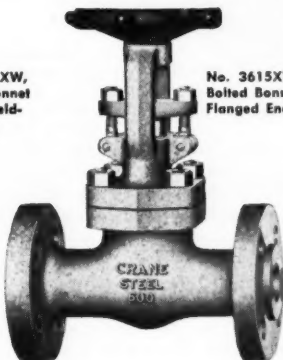
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No. 3611XW,  
Bolted Bonnet  
Socket-Weld-  
ing Ends

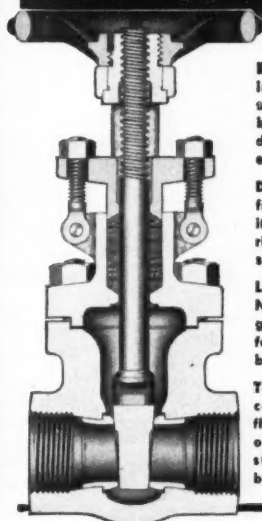


No. 3615XW,  
Bolted Bonnet  
Flanged Ends.



UNION BONNET  
GATE. Screwed ends.  
Sizes: 1/4 to 2-inch.  
Available in three  
different trim materi-  
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**DEEP STUFFING BOX**  
filled with high qual-  
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rings maintains tight  
stem seal.

**LEAKPROOF BON-  
NET JOINT.** Soft iron  
gasket in male and  
female joint cannot  
blow out.

**T-HEAD DISC-STEM**  
connection provides  
flexibility for smooth  
operation; prevents  
stem distortion or  
binding of parts.

Cross-section No. 3607XW, Bolted Bonnet Gate, Screwed

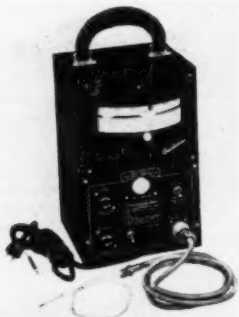
# CRANE CO.

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CHEMICAL ENGINEERING—November 1952

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## NEW INSTRUMENTS & CONTROLS



### Temperature Controller Is Portable

Engineers having need for a portable instrument to intermittently control temperature at different plant locations will welcome the new portable Guardsman controller. Precision control is accomplished by merely plugging the instrument into an electrical wall outlet and connecting it to the unit to be controlled. Then the instrument thermocouple is inserted into the place where the temperature is to be controlled.

True temperature is indicated by the upper pointer. Control to any desired point is secured by setting the lower pointer to the correct scale position by means of the external setting knob. Two power outlets enable the instrument to control not only temperature but also other variables such as the speed of fans, blowers and agitators.

Choice of three models provides on-off control, proportioning control and a combination of either high limit control or on-off control. All models have a dual scale range of 50 to 500 deg. F. and 0 to 2,000 deg. F.—Taco West Corp., 525 N. Noble St., Chicago 22, Ill.

### Calibration Weights Ease Instrument Checks

A set of calibration weights recently developed is said to do away with the need for removing differential converters from service for checking purposes. In addition to facilitating routine calibration checking of pneumatic instruments, the weights determine sources of trouble in systems. If recalibration is needed a water column should be used since the weights are intended for checking only.

Included in the set are nine weights totalling 16 lb. and a hanger. Unit weights range from 0.1 to 6 lb. Charts and conversion tables are not required when using these weights as directed.—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia, Pa.

### Flow Ratio Controller Covers Very Wide Range

The Ratomatic flow ratio controller is claimed to provide accurate flow ratio settings from 15 to 600 percent. Use of variable-area flowmeters having uniform flow scales permits greater precision of control and readability of record charts. Coupled with this is the use of the new Pneumatrol pneumatic control unit which adjusts the air pressure actuating the flow control valve to the pre-set ratio.—Fischer & Porter Co., Hatboro, Pa.



### Pyrometer-Millivoltmeter Is Portable, Accurate

A new combination temperature indicating pyrometer and millivoltmeter is designed for easy portability to the job combined with a high degree of accuracy. The long thermocouple and leads permit checking temperatures up to eight ft. from the instrument.

Three scale ranges are available calibrated in fahrenheit, centigrade and millivolts, as follows: 800 deg. F., 430 deg. C., 17 m.v.; 1,600 deg. F., 865 deg. C., 36 m.v.; 2,250 deg. F., 1,225 deg. C., 50 m.v. Automatic compensation is provided for internal resistance changes due to variation in ambient temperature.—Thermo Electric Mfg. Co., 480 Huff St., Dubuque, Iowa.



### Pressure Gages Protected by Transmitter

The King Pressure Transmitter has been designed to give a positive seal between pneumatically operated pressure instruments and the fluid being measured. Sealing is obtained by a diaphragm. Fluid pressure on the outer side of the diaphragm is continuously and automatically balanced by air pressure on the inner side. This air pressure is transmitted through a pipe or tube to the receiver which can be a hydrostatic gage, a manometer or a pneumatically-actuated recorder.

This device has a pressure range of 0 to 45 psi. and can withstand overpressures of 250 psi. A supply of clean, dry instrument air at 70 psi. or higher is necessary. Air consumption is less than 4 cfh. of free air.—King Engineering Corp., Ann Arbor, Michigan.

### Simplified Controller Is Highly Accurate

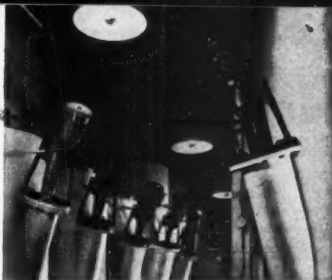
The design of the new P-4 pneumatic controller approaches the simplest basic schematic control diagram. Functional layout has assured compactness and elimination of links. Air passages are formed in the precision die castings to eliminate external tubing except for connections to output and supply.

This instrument can be used for controlling rate of flow, differential pressure, liquid level, viscosity, pressure and temperature applications. The P-4 Pneumatrol controller is usable for either single or dual instrument case mounting and for point of measurement installation as well.

The unit is a true motion balance controller and not the force balance system commonly employed in point-

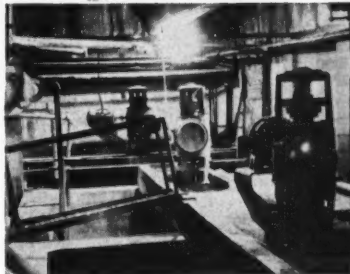


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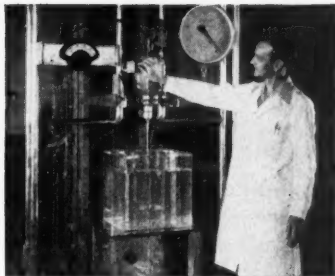
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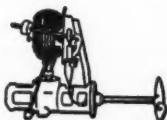
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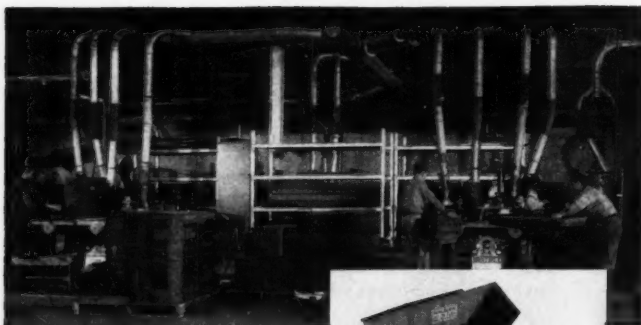
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Exhaust heads and piping, engineered to fit the job, capture dust particles at the source, before they can escape to cause trouble and cost money.

# Pangborn presents Woodall\* with "DUST to BURN!"



Close-up of Pangborn Collector showing special dust hopper, dust storage bin and exhaustor discharge duct.

## \*How Woodall Industries, Inc., uses Pangborn equipment to save \$14,000 per year!

Woodall Industries, Inc., Long Island, N. Y., produces Masonite panels in varying shapes and sizes for the automotive, railroad, television, and refrigeration industries, to name just a few. Shaping and drilling these panels produces Masonite dust—and plenty of it!

Without an effective system of dust control, Woodall workers would soon be knee-deep in dust. Thus, the Pangborn Dust Control System installed at Woodall would be essential at any cost. The beauty of the system, however, is that it *doesn't cost at all*—but actually pays its own way, with a nice profit to boot!

That's because this Pangborn Dust Control System not only

maintains a dust-free plant, but also provides *all* the fuel for all heating and processing requirements, by conveying the Masonite dust from its source to a boiler furnace. Savings in oil alone have been figured at about \$14,000 a year!

Add to this the savings in "house-keeping" costs, benefits in improved health and morale of employees—and you can see why Woodall is so enthusiastic about their Pangborn Dust Control System.

**What are your Dust Problems?** Find out what Pangborn can do to solve them. Write today for Bulletin 909A. Address: PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in  
Dust Control and Blast Cleaning equipment

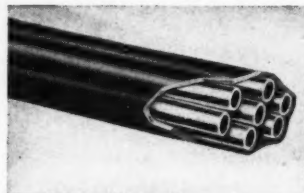
# Pangborn

## DUST CONTROL

**STOPS THE DUST HOG from stealing profits**

## EQUIPMENT NEWS, cont. . .

of-measurement (stack) controllers. It is available in all modes of control including on-off, narrow band proportional, wide band proportional with manual or automatic reset and with or without derivative action.—Fischer & Porter Co., Hatboro, Pa.



## Polyethylene Sheet Guards Instrument Tubing

Two new instrument tubing harnesses are said to be impervious to attack from moisture or corrosive industrial atmosphere.

Both types of harness use an extruded polyethylene sheet to protect a bundle of instrument tubing. In one type, the individual lengths of tubing are made of copper or aluminum, while in the other type polyethylene tubes are used.

Standard Impervapak Metl-Cor is supplied with 4, 7 or 10 metal tubes of  $\frac{1}{4}$  or  $\frac{3}{8}$ -in. outside diameter in lengths up to 50 ft. Impervapak Poly-Cor is supplied with 4, 7, 10, 14 or 19 tubes of  $\frac{1}{4}$  in. O.D. having a  $\frac{1}{8}$ -in. bore and lengths in coils of 500 to 1,000 ft. Standard pressure-tight fittings are used to join successive lengths of harness together.—Samuel Moore & Co., Dekoron Tubing Div., Mantua, Ohio.

## Level Indicator Has No Floats

Continuous level measurement without mechanical or pneumatic means is attained by the Telstor, a new electronic instrument. It is said the level of almost any type liquid, viscous fluid or granular solids in practically any type container is readily measured by this device.

The Telstor instrument consists of an electronic unit, an insulated electrode and an indicator unit. The electronic unit is mounted adjacent to the tank, bin or vessel. Inside the vessel the insulated electrode is mounted vertically running from top to bottom and connected to the electronic unit by coaxial cable. Location of the indicator can be anywhere



within a mile of the vessel being measured; cable connects it to the electronic unit.

In operation the electrode in the container becomes one side of a radio frequency capacitor with the container walls serving as the other side. The material stored in the tank or bin increases the capacity between the electrode rod and the container walls, in proportion to the depth the electrode is submerged. This variation is in turn shown on the indicator unit meter scale.—Fielden Instrument Div., Robertshaw-Fulton Controls Co., Philadelphia, Pa.

#### Analog Computer Is Flexible, Economical

The new EASE analog computer is said to offer increased speed and flexibility in the accurate solution of problems involving the interrelation of multiple variables. The computer can be used as an equation solver, a simulator, or a tester. Linear 7th order total differential equations are readily solved. Addition of minor auxiliary equipment enables the computer to solve many non-linear equations. As a simulator the unit answers designers' questions on how a certain device will function in actual operation under varying conditions. Operating as a tester for sub-systems and associated equipment the computer functions as a quickly set-up substitute for a dynamic system.—Beckman Instruments Inc., Special Products Div., So. Pasadena, Calif.

#### Recorder Instrument Has Refined Adjustments

Simplified measurement and the recording of a large number of variables is featured in a new strip chart recorder. This instrument has adjustments to vary span, suppression, damping and amplifier sensitivity. The multi-purpose recorder can measure and record varied spans as well as the magnitude of various electromotive forces developed by strain gages, thermocouples, tachometers and miscellaneous laboratory equipment which provides a d.c. signal output.

In appearance the recorder resembles the type 153 recorder except for the six adjustment knobs located near the bottom of the door. The instrument will be produced in both single and multipoint models—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Ave., Philadelphia 44, Pa.

## Here's how Pangborn

# Solves these Problems with this modern equipment

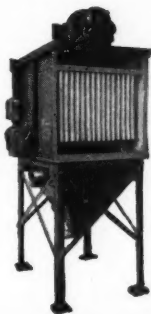
## BLAST CLEANING!



**Blast Cleaning Cabinet** quickly and easily cleans rust, grime, dirt, paint, etc., from metal parts. Produces a clean, smooth surface on pieces up to 60" x 36". Models available from \$319.00 and up.

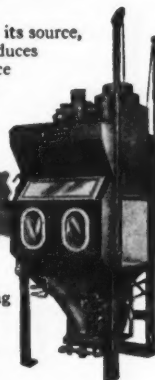


**Blast Cleaning Machine** not only removes rust, dirt, scale, etc., but is ideal for maintenance and many other uses. Cleans large objects such as bridges, structural work, tanks before painting. Six sizes, portable or stationary, from \$170.00 and up.



## DUST COLLECTING!

**Unit Dust Collector** stops dust at its source, minimizes machine wear and tear, reduces housekeeping and general maintenance costs. Solves many grinding and polishing nuisances. Reduces material losses. Models from \$286.00 and up.



## PRECISION FINISHING!

**Hydro-Finish Cabinet** uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001". Models from \$1410.00 and up.

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CLEANING AND DUST  
CONTROL EQUIPMENT

# Pangborn

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  - ☐ Blast Cleaning Machines
  - ☐ Unit Dust Collectors
  - ☐ Hydro-Finish Cabinets

PANGBORN CORP., 2600 Pangborn Blvd., Hagerstown, Md.

Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....

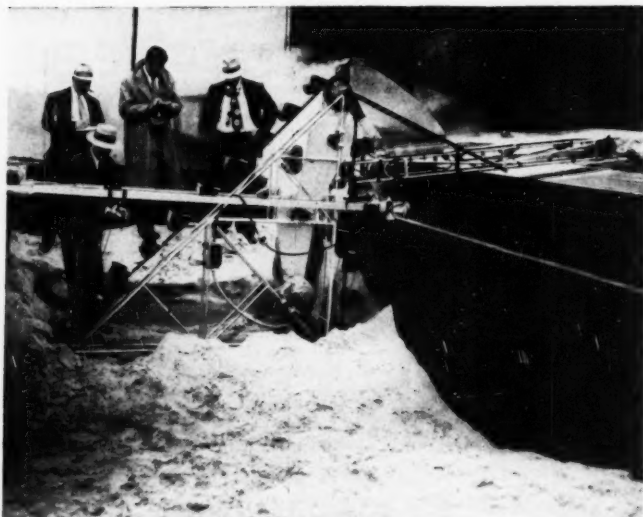
Company.....

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## NEW PACKAGING & HANDLING EQUIPMENT



GONDOLA UNLOADER chews into carload of dry solids.

### Car Unloader Saves Time

**New bucket unloader removes granular materials from railroad cars in 15 to 40 percent of manual unloading time. Costs are cut up to 85 percent.**

A new combination of a bucket unloader and suitable conveyors offers a time and labor saving materials handling tool for unloading granular materials from box and gondola railroad cars. A secondary advantage is that cars are released sooner for other use.

The boxcar unloader consists of a bucket-carrier, a short primary conveyor and a longer telescoping conveyor. Buckets are reinforced pressed steel. Drive is by 1 hp. explosion-proof motors. Conveyor belts are 12 in. wide fabricated of 3-ply rubber-impregnated canvas, and move up to 250 fpm. Supporting frames are tubular aluminum.

The start of the unloading operation is made by placing the bucket carrier in the car opening. Material is dumped from the buckets onto the primary conveyor belt which carries it to the receiving area. Once the central part of the car is cleared the operator attaches the telescopic conveyor to the bucket carrier. Unloading then proceeds as the buckets chew

into the material at either end of the car.

Gondola cars require a somewhat different combination of units. First there is a cradle which is supported on the car rim and runs along its

length. The bucket carrier is mounted on the cradle while a take-away belt conveyor is suspended from the bucket carrier as shown above.

As the unloading progresses the position of the cradle can be shifted to keep the bucket properly located with respect to the dwindling load in the car. At the same time the buckets may be raised or lowered as required.

The manufacturer reports that the boxcar unloader with one operator will empty one car in a period of 3 to 5 hr. for a total unloading cost of \$8-\$10. The manual unloading time for four men is 24 to 48 man hr. at a cost of \$60 to \$70.

A similar comparison for the gondola unloader shows an unloading time of 3 hr. using one operator for a cost of \$8. The same job performed manually would take two men 8 to 12 hr. at a cost of \$32 to \$48.

Weighing 640 lb. the gondola machine costs \$1,900. Cost for the 675 lb. boxcar unloader is \$2,800.—The Rajon Co., P.O. Box 149 Maywood, Calif.

### Drum Attachment Is Simple, Automatic

The Marvel Lift-O-Matic drum attachment is said to handle any drum regardless of bead or rim size. It can be attached to any Yale fork truck in a few minutes. No additional controls are required, since pick-up and release are effected through raising and lowering the truck lift cylinder. Since there are no side clamps or projections,



### FORK-LIFT TRUCK SPOTS SEMI-TRAILERS

A new attachment which slips over the forks enables this fork-lift truck to move and position empty semi-trailers. Plate on attachment engages pin on trailer, thereby coupling lift truck to the trailer.—Clark Equipment Co., Industrial Truck Div., Battle Creek, Michigan.

Established 1888

# D.O. James

**CENTRALLY DRIVEN BALANCED DRIVE**  
With Great Emergency Strength

## GEAR SPEED REDUCERS



### D.O. JAMES GEAR MANUFACTURING CO.

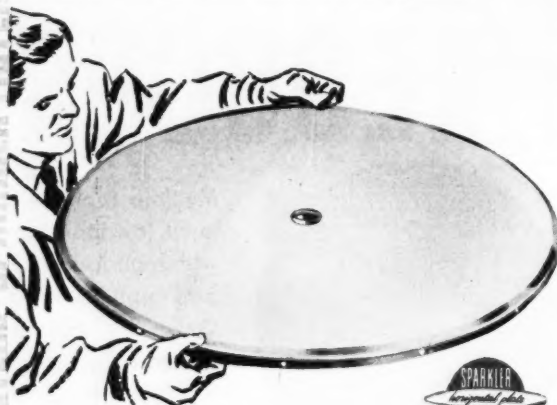
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Makers of Every Type of Gear and Gear Drive Equipment

SPARKLER FILTERS-SPARKLER FILTERS

# SPARKLER FILTERS

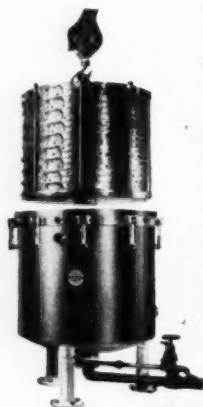
Designed to use diatomaceous earth without the necessity of a fibrous material pre-coat to hold cake on the plate.



With Sparkler horizontal plates there is no tensile strain on the cake. Even a very thin cake can be built up without danger of slipping or breaking as it rests in a horizontal position on the plate and requires no pressure to hold it in position. This saves considerable cost in pre-coating.

Sparkler horizontal filter plates can be removed for cleaning in one unit assembly and a clean set lowered into the filter tank immediately. This feature reduces down time to a matter of minutes.

Representatives in all principal cities in the U.S.A.



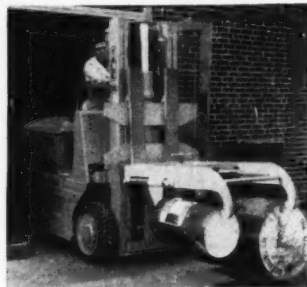
## SPARKLER MANUFACTURING CO. Mundelein, Ill.

Sparkler International Ltd.  
Herengracht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.  
Mundelein, Ill., U. S. A.

EQUIPMENT NEWS, cont. . .

drums can be picked up and spotted in close positions for maximum utilization of storage space. More than one attachment can be mounted on a truck for the multiple handling of drums.—The Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia 15, Pa.



### Truck Drum Attachment Carries Different Sizes

A new fork truck drum handling attachment is capable of carrying two different sized drums at the same time. Operation of this horizontal drum handler is completely mechanical, requiring no special hydraulic system. Unit is attached to the truck by clamping directly on the forks.

To pick up drums, the driver tilts the mast backward and engages rear hook of each boom of attachment with the rear end of each drum. By moving the truck slowly forward and tilting mast forward, the front hooks are engaged. Long tension springs keep rear hooks in contact with drums. Picking up the load locks the rear hooks for positive grip. To deposit the load this procedure is reversed.—The Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia 15, Pa.

### Drum Rinsers Is Fast, Efficient

Drums contaminated by materials soluble in petroleum solvents are quickly and efficiently cleaned by the Gilbarco internal drum rinser. The unit consists of a two compartment tank and pumps connected to a multiple nozzle assembly.

One compartment of the tank is filled with solvent which is supplied to the spray nozzle pipe by a pump mounted on top of the tank. Flow is controlled by a valve at the nozzle. The other tank compartment is a vacuum chamber which evacuates solvent

from the drum being cleaned and returns it to the supply compartment of the tank.

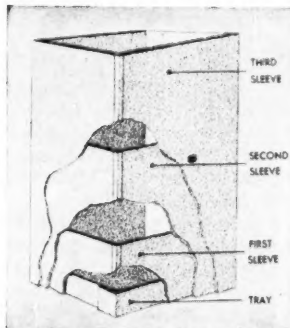
The cleaning operation is carried out simply by tilting the drum to a 45 deg. angle and inserting the nozzle pipe through the large bung at the top. Two control valves on the nozzle are opened and solvent is forced into the drum through a series of small holes in the outer nozzle tube; simultaneously the contaminated solvent is being evacuated from the drum through the inner nozzle tube. Total cleaning time per drum is 2.5 to 3 min. including handling of the drums.

—Gilbert & Barker Mfg. Co., West Springfield, Mass.

#### Aluminum Box Holds Product Or Scrap

The corrosion resistance and light weight of aluminum are being put to good use in a new line of materials handling boxes. Measuring 60 x 42 x 36 in. and weighing only 245 lb. these boxes will carry a 5,000 lb. load. Welded construction is used throughout in fabricating the 61S alloy sheet and extrusions into finished boxes.

When mounted on low runners these containers may be readily lifted and carried by fork trucks. Tying lugs make stacking an easy problem. —Powell Pressed Steel Co., Hubbard, Ohio.



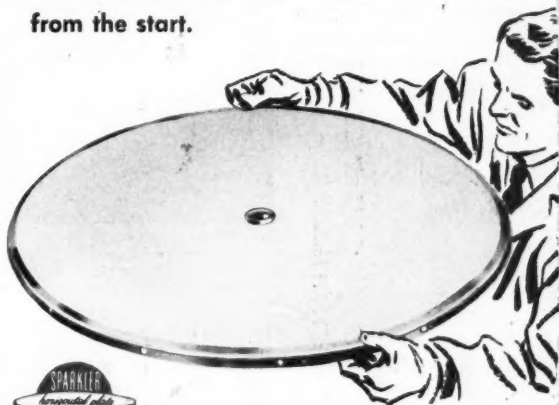
#### Corrugated Container Holds Ton of Rubber

Corrugated board containers are really moving into the heavyweight class with a new carton design which holds a ton of synthetic rubber bales. Up to 32 bales weighing 75 lb. each are being combined in one compact load that requires less storage space and is easier to handle than skid loads of multi-wall bags, it is claimed.

A base tray and several sleeves of different heights make up the con-

# SPARKLER FILTERS

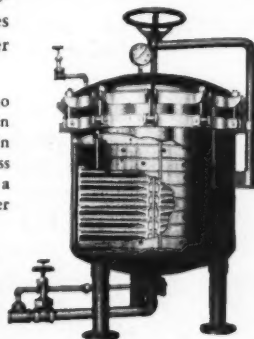
Designed for maximum pre-coat economy. Only a thin pre-coat cake is necessary to assure brilliant clarity of the filtrate right from the start.



Sparkler horizontal plates permit the filter media to be floated onto the plate and deposited with gravity into a cake of uniform thickness and uniform density even though the first pre-coat is very thin. This saves considerable time and Filter Aid in pre-coating.

Since no pressure is needed to hold this thin pre-coat cake in position it is possible to begin filtering operation with less pressure which results in a cake of less density and greater flow rate.

For personal service on your filtering problems, address correspondence to Mr. Eric Anderson



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# U. S. TOBACCO COMPANY INSTALLS RANDOLPH AUTOMATIC FIRE SYSTEM

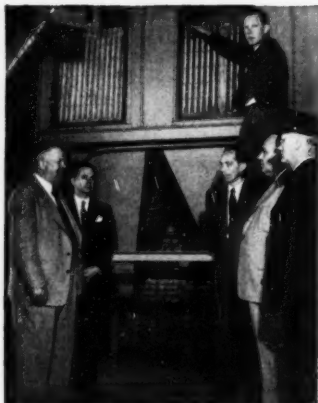
The U. S. Tobacco Company's large multiple unit dust collector presented an unusual and worrisome fire hazard, but this 150 pound Randolph Automatic System not only automatically detects and extinguishes any fire that might occur in the unit, but also shuts down the dust collector blower, and rings an alarm located on one of the lower floors of the building.

## Kills Fire, Sounds Alarm and Shuts Down Machinery

As in the U. S. Tobacco installation, Randolph Systems, in addition to automatically killing the toughest fires in split seconds, can also be equipped with duct and door closers, motor, fan and machinery shut-offs, warning alarms and other auxiliary safety devices. Systems are designed for both local application or total room flooding and are ideal for dip tanks, baking ovens, spray booths and hundreds of other applications.

### Free Catalog and Engineering Service Available Without Cost

Randolph's FIRE HAZARD INDEX gives correct equipment and methods for protection against 590 typical fire hazards. Write for your free copy today. Address: Randolph Laboratories, Inc., 10 E. Kinzie St., Chicago 11, Ill.



Officials of the U. S. Tobacco Co., and the Nashville Fire Department inspect the Randolph Automatic System installed on giant dust collector.



Battery of Randolph CO<sub>2</sub> cylinders in U. S. Tobacco system.

### EQUIPMENT NEWS, cont. . .

tainer. These components are assembled in stages as the filling operation proceeds. First, a short sleeve is slipped around the base tray. This relatively shallow container is then filled with rubber bales. Next, a higher sleeve is placed in position and more contents added. Finally the tallest sleeve is positioned and the filling operation completed.

The completed container now has four thicknesses of corrugated board at the bottom of the side wall where the pressure is greatest and only one at the top where less pressure is exerted. An ordinary blade type fork truck can pick up the filled container and transport it to storage or to a waiting freight car or truck.—Gaylord Container Corp., 111 N. Fourth St., St. Louis, Mo.



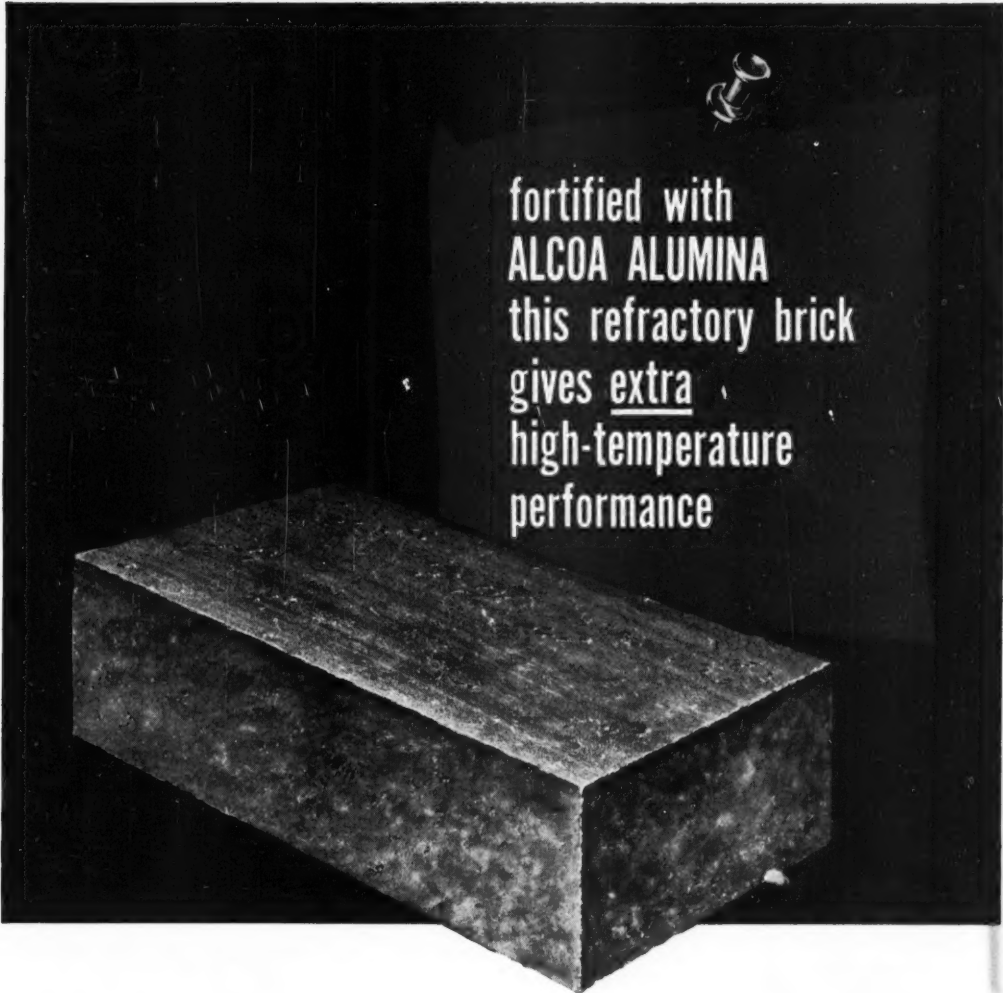
## Lift Truck Has Drum Carrier

The lift truck drum carrying attachment seen above lifts and carries four 55-gal. drums in an upright position. Known as the Tray-Hart drum carrier, this unit mounts on a 3,000-lb. capacity Model A-3444 lift truck.

Weighing 750 lb. and measuring 54 in. long by 51 in. wide, the carrier attachment is designed for flexible operation. When the lift truck is not in line with the load a misalignment compensator automatically shifts the carrier a maximum of 4 in. Special angles automatically place drum in a gripping position as the carrier frame is lowered over the load.

Gripping shoes are equipped with non-slip lining and quickly conform to the contour and position of drums. Drum weight and the gravity wedging action of gripping shoes insures a positive grip. Load releasing mechanism is activated by a hydraulic control unit.—Mercury Mfg. Co., 4044 South Halsted St., Chicago 9, Ill.





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ALCOA ALUMINA  
this refractory brick  
gives extra  
high-temperature  
performance

To meet the requirements of higher operating temperatures, manufacturers are fortifying their refractory mixes with more and more ALCOA Alumina. It's a *sure way* to improve performance and reduce costly down-time.

For instance, ALCOA Alumina gives refractories:

- EXTRA strength and stability under load at high temperatures
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- EXTRA low coefficient of expansion
- EXTRA high resistance to thermal and mechanical shock
- EXTRA low porosity and shrinkage

Furthermore, these performance characteristics improve in almost direct ratio to the alumina content of each refractory!

If you are looking for *better* refractory performance at higher operating temperatures, look for refractories containing ALCOA Alumina. You'll find they last longer . . . require fewer tear-downs . . . are most economical in the long run.

We do not make refractories, but we shall be glad to discuss the characteristics and properties of the various grades of ALCOA Alumina. Write to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION 602-L Gulf Building, Pittsburgh 19, Pennsylvania.

*Alcoa Chemicals*



**ALUMINAS and FLUORIDES**

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS  
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

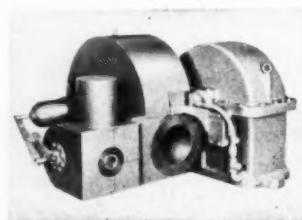
## NEW ELECTRICAL & MECHANICAL EQUIPMENT



**Spray Gun  
Blends Paint, Catalyst**

The development of Nu-Pon A quick-curing synthetic resin finish has brought about a new spray gun design for applying the new finish. The need for a new gun design stems directly from an outstanding characteristic of the finish—it cures quickly following addition of the catalyst. This would plug the openings of a standard type gun in a short time.

The new gun has a dual feed head which provides for bending of the paint and catalyst after they leave the gun. Paint and catalyst are kept in separate supply tanks which are connected to a common air pressure supply. This is said to insure maintaining the proper ratio between paint and catalyst.—Binks Mfg. Co., 3122 Carroll Ave., Chicago 12, Ill.



**Reduction Gears  
For Turbine Drive**

A new line of high-speed reduction gears for mechanical drive turbines has been announced. The new gears are available in built-in or coupled designs. Built-in gears include a turbine and gear case firmly secured together, with turbine wheels and pinions mounted on the same sturdy high-speed shaft. This eliminates exhaust end bearing and coupling giving a compact unit of minimum overall

length. The coupled design is a self-contained gear unit which is flexibly coupled to a separate turbine drive.

Both designs feature precision hobbled double helical gears, liner-type sleeve bearings, special Kingsbury type shaft seals, and self-contained forced feed lubrication system. The new line of gears is offered in gear ratios up to 5 to 1 for built-in units; up to 8.5 to 1 for the coupled design.—Elliott Co., Jeannette, Penna.

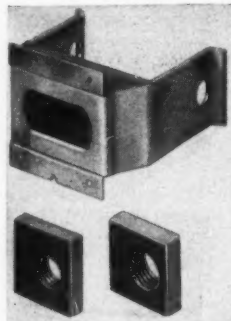


**Variable Speed Motor  
Has Remote Control**

A mechanical remote control is one of the features of the Type 5VA fractional horsepower variable speed motor. A flexible 5-ft. cable connects the indicating control handwheel with the motor variable-speed mechanism. The Varidrive unit is available in  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  and 1 hp. sizes with speed ratios up to 10 to 1 over a range from 4,000 to 10,000 rpm.—U. S. Electrical Motors, Inc., Los Angeles 54, Calif.

**Welding Helmet  
Is Seamless, All Plastic**

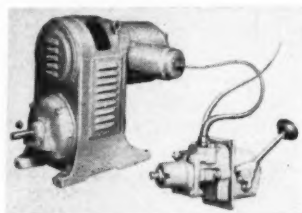
An exceptionally strong, moisture-resistant, light plastic helmet is made from thermo setting fiberglass reinforced polyester resin. A complete insulating glass holder made from shredded canvas base Bakelite provides strength and lightness. Filter and cover glass are quickly inserted and held securely in a flexible manner to prevent breakage. A four-position adjustable stop is supplied as standard equipment. The flexible plastic head band conforms readily to any head contour, providing maximum comfort.—The Boyer-Campbell Co., 6540 St. Antoine St., Detroit 2, Mich.



**New Concrete Insert  
Eliminates Bolt Fishing**

A new type of fully adjustable insert for use in concrete is said to save time and labor. By using a nut with an offset hole, it is possible to place the nut on a bolt before placing it in the insert. Thus you eliminate time-consuming fishing to get the bolt started after the nut has been placed in the insert.

The inserts will support loads of from 1,500 to 2,400 lb. Notches in the insert face and center grooves on the side simplify alignment of the insert on the forms. Four small holes permit placing the insert on dowel pins or reinforcing rods. Inserts are made of heavy gage steel and can be obtained for bolt sizes from  $\frac{1}{4}$  to  $\frac{3}{4}$  in.—Super-Grip Anchor Bolt Co., Inc., 3333 N. 22nd St., Philadelphia 40, Pa.



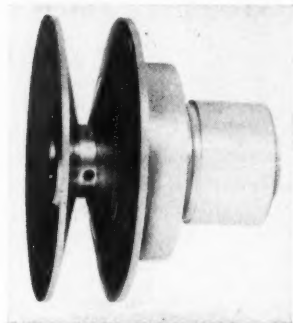
**Variable Speed Motors  
Have Pneumatic Controls**

A pneumatic remote control is now used on the standard line of varidrive variable speed motors. The control consists of a positioning unit, an air-operated plunger attached to the speed changing device, and an airvalve which remotely controls the positioning unit.

Four types of valves are available, depending upon the method desired to operate the mechanism. These are pedal, lever, cam, or wheel. The posi-

tioning units are designed to operate with an air pressure of either 60 or 100 psi.

Through the use of check valves, and control station selectors in the system, the speed of the Varidrive can be changed from any number of control stations. Conversely, any number of motors may be controlled by one station, providing they are to operate at the same speeds.—U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.



#### Variable Speed Pulley Uses Standard Belts

A new variable speed pulley design permits the use of standard "A" section belts. An exclusive telescopic movable disk is said to eliminate interlocking disks reducing belt wear and vibration and permitting infinitely variable speed changes within  $2\frac{1}{2}$  to 1 ratio, while equipment is running.

Var "A" Cone is machined of high-grade cast iron and fitted with oil impregnated bushings. Unit is rated up to  $\frac{3}{4}$  hp. and 1,750 rpm.—Gerbing Mfg. Corp., Northbrook, Ill.

#### Center Break Switch Has New Contact Assembly

A new line of DMK horizontal center break switches incorporate a new contact assembly featuring independently-sprung pressure-applying springs; a new bronze ball-bearing swivel terminal; and insulator bearings with non-rusting, double-race stainless-steel ball bearings. The PMK-22 switch has a direct linkage connection between the two rotating insulators. The PMK-23 has a center bearing with a toggle linkage between the two rotating insulators.

These new switches are available in all standard voltage ratings from 7.5 to 161 kv. and in ampere ratings



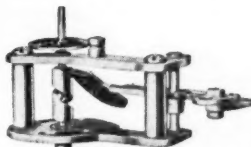
# HELICOID



*The gage that  
retains its  
original accuracy  
longer,  
lasts longer,  
costs less  
per gage, per year*

• Only **HELICOID GAGES** have the Helicoid Movement . . . tested and proved in years of hard service . . . a simple cam and roller design that does not have any teeth to wear out. Helicoid Gages cost less in the long run because they give long, trouble-free service with a minimum of maintenance.

Helicoid Gages can be furnished with **ACALOY** cases in flanged (illustrated), flangeless or flush mounting (round or square); also in phenol—with black, white or phosphorescent dials; phosphor bronze, alloy steel, stainless steel or K Monel Bourdon tubes; in pressure, vacuum or compound types; in a full range of pressures; all with the Helicoid stainless movement.



#### FOUR HELICOID FEATURES

1. Stainless Steel Helicoid Roller (no gear teeth)
2. Stainless Steel Hair Spring
3. Long Life Cam (no gear teeth)
4. Corrosion Resistant Link and Screws

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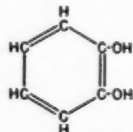
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**In Bactericides • Antioxidants**  
**Photography • Perfumery • Medicinals**  
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And Catechol enters into a host of other chemical reactions:

Hydrogenation  
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Alkylation  
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 Esterification

Etherification  
 Ammonolysis  
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 Coupling

● Koppers Chemical Division produces this important chemical in two commercial grades:

**Catechol C.P.**—with a minimum purity of 99.0%, in the form of crystalline granules.

**Catechol Resublimed**—with a minimum purity of 99.6%, in the form of glistening white needles.

Catechol C.P. is useful in chemical manufacturing and processing, while Catechol Resublimed has medicinal and photographic applications.

The ready availability of this organic chemical recommends its further study in your laboratories. For more information, write for your copy of Koppers Bulletin C-9-127 which gives full details on properties, uses and reactions of Catechol.



**KOPPERS COMPANY, INC.**

Chemical Division • Pittsburgh 19, Pa.  
 Dept. CE-112

EQUIPMENT NEWS, cont. . .

of 400 (up to 46 kv.) 600, and 1,200 amp.—Delta Star Electric Co., Division of H. K. Porter Co., Inc., 2437 W. Fulton St., Chicago, Ill.



### Universal Coupling Features Compact Design

Simplified construction with a reduced number of working parts makes this universal coupling relatively small in relation to the size shaft it will turn. The unit consists of a ball fitting into a socket with the stress of power transmission absorbed by two oversized keys. The assembly is held in place by a rolled and crimped cap. Bearing surfaces are heat treated and machined to close tolerances. A reservoir in the base of the socket retains lubricant for self-feeding to points of wear. Maximum deflection is 30 deg.—B. M. Root Co., York, Pa.

### Bucket Elevator Boot Has Automatic Take-Up

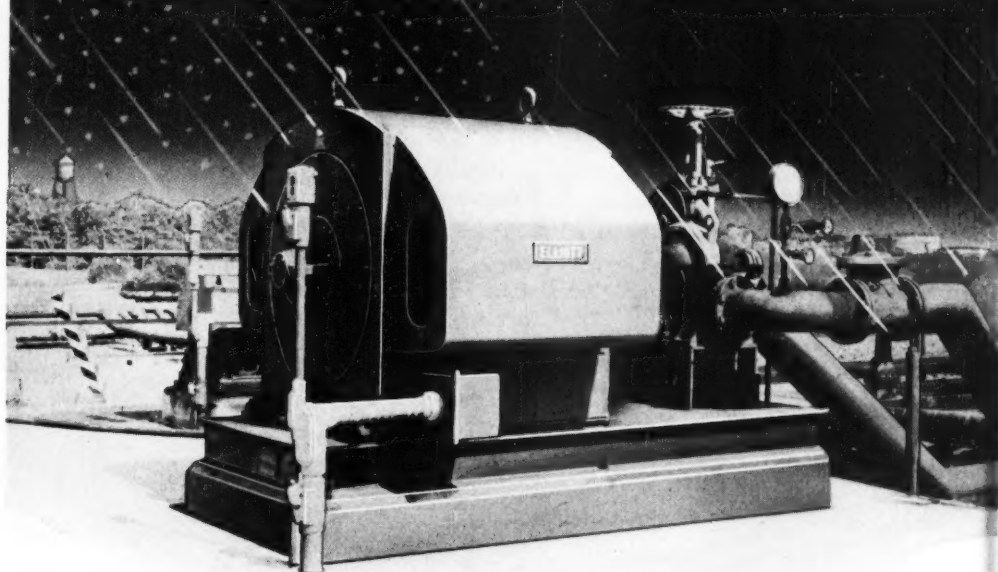
The new Beaumont bucket elevator boot provides automatic take-up of the elevator chain to maintain proper tension. Watertight construction of the boot is said to keep material dry even though several feet of water may be in the bucket elevator pit. Service records on test installations handling abrasive materials indicate no sign of wear nor any maintenance expenditures in two years of operation, it is said.

The take-up mechanism is a full-floating, self-adjusting automatic type. A smooth rim traction wheel used for take-up results in increased service life for the elevator chain. Also this wheel will not permit the bucket to be forced off the chain.—Beaumont Birch Co., Chemical Handling Div., 1505 Race St., Philadelphia 2, Pa.

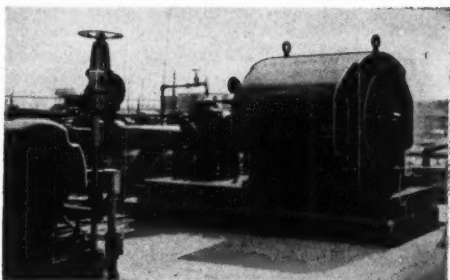
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# Weather doesn't matter...



## ...to the ELLIOTT OUTDOOR SPLASHPROOF MOTOR!



**Top picture:** Elliott 250 hp. outdoor motor driving pump in a refinery, exposed to the battering winter storms sweeping across three thousand miles of the North Atlantic.

**Just above:** Another view of the installation, showing also, at left, a smaller Elliott Crocker-Wheeler motor.

☞ Howling blizzard, sleet, tropical deluge, fog, salt spray, dust-storm—none of them have anything to say to this tailored-to-the-job Elliott "Fabri-Steel" squirrel-cage induction motor, shown in the photo above driving a pump for an important northeastern oil refinery. This motor saves three ways—(1) makes housing unnecessary—(2) makes special vented foundation unnecessary, needing only a simple slab—(3) makes awkward piping layout unnecessary, since you can put it just where you want it, regardless of cover.

Built in third frame above NEMA and larger. The Outdoor Motor Bulletin, PB-7000-3, gives full data. On request.

### ELLIOTT Company

**Ridgway Division  
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## It's a Matter of Record

### It's a Matter of Record

REFINING... NATURAL GASOLINE AND PETROL-CHEMICAL PLANTS OPERATE ON A 24-HOUR SEVEN-DAY-A-WEEK BASIS. WHEN YOU NEED A PUMP FOR YOUR PLANT YOU DON'T RUSH OUT WITH A WAD OF BILLS AND BUY A PUMP...

### It's a Matter of Record

YOU SPECIFY Precision Built Pumps by PACIFIC PUMPS INC. because pumps for your exacting service are a considered purchase and

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that customers say... "We believe Pacific is just about the finest group of pumps we know anything about."

### It's a Matter of Record

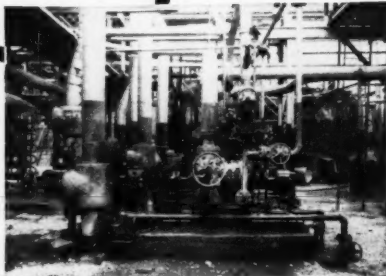
That in the continuous process industries... shutdowns are costly... maintenance is a big problem... availability of parts and service facilities are important.

### It's a Matter of Record

That customers say... "Pacific Pumps Inc. is large enough to stand behind the product they manufacture and small enough to give each order individual attention."

### It's a Matter of Record

The excellent performance of the two stream-turbine driven four-stage pumps installed in 1939 to pump light hydrocarbons of .465 sp. gr. operating at 3400 R.P.M. In 1942 the speed was increased to 3900 R.P.M. From 1939 to 1950—time on stream 82%... pump parts refinished 0... pump parts replaced 0. Third unit installed in 1947 to operate at 4000-4200 R.P.M.



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EQUIPMENT NEWS, cont. . .

### Anchor Bolts Have Increased Grip

A new bolt anchoring assembly for use in masonry is said to give 50 percent greater anchorage for mounting conduits, gas pipes and water pipes. The assembly consists of a pipe or eye bolt, a lead sleeve, and a patented cup-shaped steel anchor. After insertion of the assembly in masonry, the lead sleeve is mushroomed out by repeated blows on a special tamping tool. Continuing blows flatten out the steel anchor, driving its ribbed steel edges into the walls of the hole. The steel anchor reinforces the lead sleeve, providing a permanent solid anchorage that keeps pipe or eye bolts from loosening.—Super-Grip Anchor Bolt Co., Inc., 3333 N. 22nd St., Philadelphia 40, Pa.



### Fence Painting Device Eases Application

A novel device is being offered to ease the chore of applying paint to chain link fences. As seen above, paint is applied to the fence by a roller applicator mounted on a pole with attached splash shield. The paint receptacle may be seen on the ground.

Mounted inside the rectangular paint receptacle is a spring supported screen. Paint level in pan is maintained below the normal position of screen. Paint is applied to applicator merely by pushing screen below the paint surface with end of applicator. Pressure is then released and applicator is rolled on screen to distribute the paint.

Loaded applicator is then rolled up and down on fence, thereby transferring paint to the wire.

The FencPainter is also said to be satisfactory for applying paint to flat surfaces.—Meinhardt Cleaning Materials Co., 2314 W. Van Buren St., Chicago 12, Ill.



# DISTILLED WATER

**in your plant...**

**a reliable source of DISTILLED WATER OF LABORATORY QUALITY  
at lowest cost with CLEAVER-BROOKS compression stills**

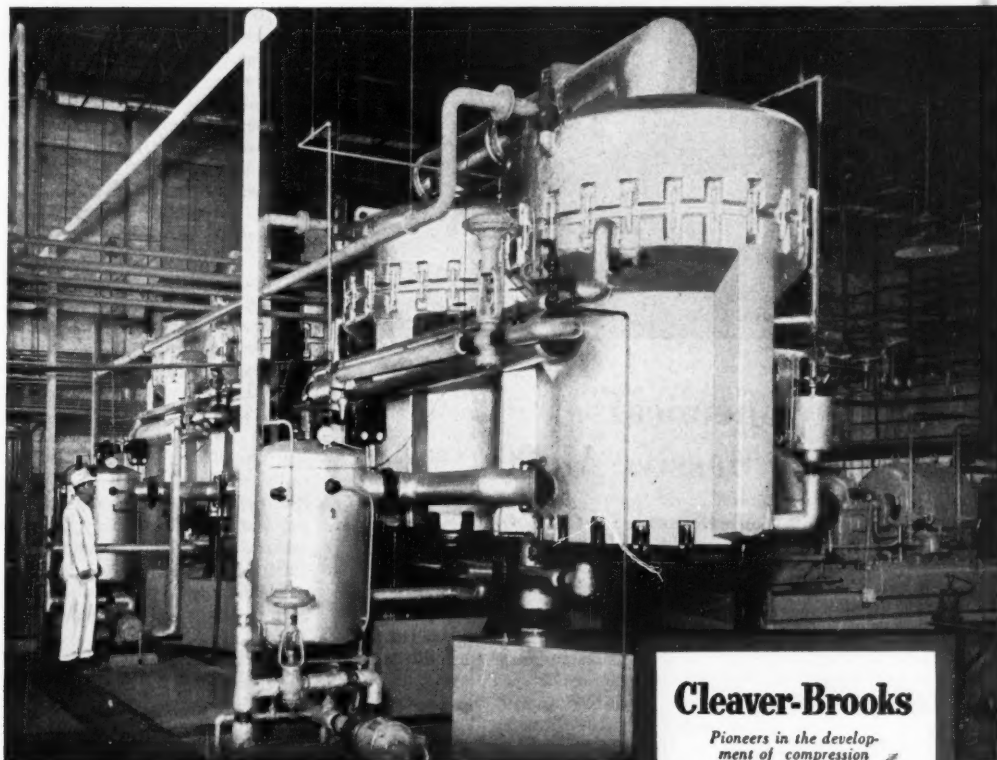
**I**F your process requires a supply of chemically pure water, the most reliable and economical way of providing it is to have your own source, independent of pipe lines, trucking or barging facilities.

From any water available, a Cleaver-Brooks Compression Still will give you USP chemically pure, pyrogen-free water . . . of quality far exceeding the high standards needed for chemical

processing or pharmaceutical preparations.

Cleaver-Brooks Compression Stills are available in standard sizes to meet your requirements . . . from 85 gph to 2800 gph . . . motor, engine or turbine driven.

Write for latest bulletin "Compression Distillation," Cleaver-Brooks Company, Dept. M, 250 No. Grand Ave., Waukegan, Wis.



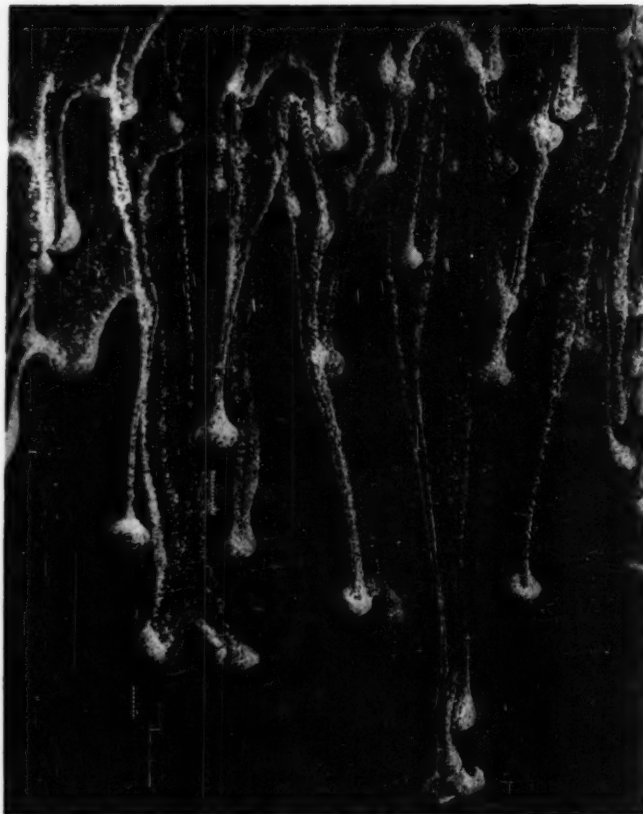
Cleaver-Brooks Compression Stills at Arrowhead & Puritas Waters, Inc., Los Angeles, Cal. This plant is one of the largest compression still installations in the world, producing over 100,000 gals. of pure water daily.

**Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers •  
Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil- and Gas-Fired Conversion Burners**

**Cleaver-Brooks**

*Pioneers in the development of compression distillation*





## Reactive Chemical Instead of Massive Metal

**Finely divided calcium is available for the first time. Vastly more reactive than the bulk form, the powder promises a whole new commercial future for the element.**

Production of calcium in a crystalline form moves the element several crucial steps closer to realizing its full commercial potential. A new manufacturing process and unique particle size make for a product that is:

- More reactive
- Purer
- Less expensive
- Easier to handle

Add these factors up and you have a new reactive metal applicable to many uses unknown with previous commercial bulk forms.

► **More Reactive**—The free-flowing crystalline powder, now being produced in pilot plant quantities, ranges in particle size from 50 to 400 mesh. The photograph above testifies to just how fine this is. Crystalline calcium

particles are shown falling through a heavy hydrocarbon oil.

Because of its greater surface area it will react at much lower temperatures and pressures than bulk calcium. Uses particularly indicated for crystalline calcium, a strong reducing agent, include: (a) the high-temperature reduction of refractory oxides of such metals as uranium, titanium, zirconium, vanadium, thorium and chromium; (b) application in organic reactions as a reducing, condensing, or polymerizing agent; (c) deoxidizing and desulphurizing of steels and other alloys; and (d) inclusion as an alloying agent with aluminum, magnesium, tin, zinc, and nickel. In many catalytic and condensation reactions, the crystalline form of calcium affords what amounts to a new reactive metal.

In the reduction of metal oxides, about the most outstanding of these potential applications, the finely divided nature of the calcium permits more intimate contact with the oxide. In addition to its strong reducing action, calcium offers its high melting and boiling points. These do away with difficulties caused by vaporization of certain other reactive metals at the high temperatures involved.

Most previous methods for obtaining metals like titanium and zirconium required intermediate preparation of the respective metal chlorides. These are usually hard to prepare and much more expensive than the oxides. The use of the oxides simplifies the process, saves chlorine.

► **Purer**—An Atomic Energy Commission report, declassified in 1948, reveals that calcium might have been extensively used in early 1942 to prepare uranium from either uranium oxide or uranium fluoride, except that "when these materials were needed it was found that there was not quantity of high purity calcium metal available."

The crystalline metal has a purity of 94-97 percent. It is essentially free of nitride nitrogen and heavy metal impurities commonly found in bulk calcium. In the production of titanium, these impurities are apt to turn out a product that is not sufficiently ductile.

Dominion Magnesium of Canada has been using calcium as a reducing

agent in making titanium because it happens to get the calcium from its other operations. And Dominion supplies most of the U. S. imports of calcium. There is very little produced in this country other than for captive use.

► **Less Expensive**—Right now calcium, the massive metal, sells for \$2.05 a lb. Introductory price of the new form will be \$1.50 a lb.

Ethyl's new crystalline calcium originates in its sodium manufacturing operation, which involves the electrolysis of fused sodium chloride. Calcium chloride, the raw material for the calcium crystals, is primarily added to the electrolyte in order to lower its melting point.

Under the calcium recovery process developed by Ethyl, the sodium-calcium sludge from the sodium plant is treated with an organic solvent which reacts with the sodium and dissolves the reaction product. Undissolved calcium metal is separated and recovered before it has a chance to react with the resulting solution.

► **Easier to Handle**—The crystalline form thus produced has decided handling advantages over bulk calcium. In closed systems the powder may be poured through lines in metered quantities from hoppers without sticking or clogging the valves or traps. Moreover, it is much easier to store since feed bins or drums can be used.

The form and nature of crystalline calcium metal strongly suggest its application to continuous processing since it can readily be held in suspension in liquid media by gentle stirring. The possible use of the fluidized powder technique is also definitely indicated.

Crystalline calcium metal can be briquetted or molded under pressure without heating. For example, the molded product can be enclosed in pipes or tubes to permit its addition to molten-alloy treating baths.—Ethyl Corp., 100 Park Ave., New York 17, N. Y.

## Anionic Softener

For use on cotton and synthetics.

Consisting of sulphonated synthetic waxes and sulphated alcohols, new Atanol BS may be used as a softener for cotton, acetate, viscose and all synthetics.

## IN BRIEF—A capsulated listing of this month's newsworthy products

### It's New . . .

Crystalline Calcium  
Anionic Softener  
Glycolonitrile  
Nylon Powder  
Fertilizer, BB Form  
Silicon Oxide  
Glass Aggregate  
Protective Coating  
Silicone Resin  
Detergent  
Rubber Latex

### It's Good for . . .

Its vastly greater reactivity than bulk form . . . 202  
Use on cotton and synthetics . . . 203  
Providing a single-reagent way to cyanomethylate . . . 203  
Sintered nylon products . . . 204  
Doing away with moisture absorption . . . 204  
A filler and blowing agent for rubber . . . 206  
Imparting insulating qualities to concrete . . . 206  
Resisting chemical fumes, food acids, moisture . . . 208  
Class H electric insulation . . . 208  
Rapid cleaning of aluminum . . . 208  
Latex emulsion paints . . . 208

See Page . . .

The manufacturer states that it does not discolor whites, or affect the light fastness of colors. It is compatible with starches, dextrans, sugars, gums and urea. Special selling point of the compound is its effectiveness with knit cottons and rayons which are to be heavily weighted with ureas or sugars.

The compound is also resistant to dilute solutions of acids and alkalis. The pH of a 0.1 percent solution is 7 to 7.5.—Dexter Chemical Corp., 819 Edgewater Rd., New York 59, N. Y.

## Glycolonitrile

A single reagent for cyanomethylation.

The cyanohydrin, glycolonitrile, is now commercially available. It will undergo esterification, ether formation, reductive methylation, hydrolysis, simultaneous dehydration and hydrolysis generally with excellent yields.

A clear, colorless to light yellow liquid, glycolonitrile is furnished as a 70 percent aqueous solution from which the anhydrous material can be obtained by distillation under vacuum. The boiling point of anhydrous glycolonitrile is 183 deg. C. at 759 mm.

Glycolonitrile offers a convenient method of cyanomethylation with a single reagent in place of the mixture of formaldehyde and hydrogen cyanide. It has been used as a solvent for polyacrylonitrile. Derivatives of glycolonitrile have been used as sequestering agents, gas absorbents, insecticides, pharmaceuticals and resin intermediates. Glycine, a derivative of glycolonitrile, has been used as a component for dentifrices, for neutralizing artificial tanning materials, as a dyestuff intermediate, and as an ingredient of animal feeds. The reaction of glycinamide and formaldehyde reportedly yields resins which are useful in the stabilization of tex-

tiles and the preparation of molded and laminated articles.—Rohm and Haas Co., Special Products Dept., Washington Sq., Philadelphia 5, Pa.

## Nylon Powder

Goes into sintered nylon products with advantages over injection molded items.

It has not been known until very recently that nylon could be prepared by special chemical means into a very fine powder form. The powder, in turn, lends itself to subsequent processing by cold pressing and sintering techniques, using methods much the same as those practiced in the field of powder metallurgy.

The powder, known as Nylasint 66, can be used for production of sintered nylon bearings, gears, valve seats and other industrial products. Sintered nylon articles appear to offer several interesting advantages over similar injection molded items.

Being processed below the melting point, laboratory tests indicate less tendency to internal strain in sintered nylon with consequent greater dimensional stability in service. This is particularly important in the field of bearings, where the somewhat erratic behavior of nylon in the past has frequently been traced to dimensional changes resulting from release of strain in service.

In addition the use of a powder without melting enables uniform blending of nylon with a wide range of fillers such as lead, copper, graphite, refractory oxides, magnetic materials. Thus specialized properties not obtainable with homogeneous molded nylon articles can be achieved.

Production of sintered nylon objects involves two steps: first, cold pressing to shape in a mold and second, sintering at a very closely controlled temperature just below the melting point in an oxygen-free con-



# NEW PACKAGED carbon dioxide FIRE EXTINGUISHING SYSTEM

**inexpensive . . . simple . . . sure!**

Do you want maximum fire-fighting power at minimum cost? Then you want the new *Kidde* Standard Pak. It's an inexpensive ready-made system you can build in for protection against tough fires in normal flammable liquid hazards.

Anyone who can cut pipe can set up this pre-engineered fire extinguishing "package." Choose from six sizes for volumes up to 6,000 cubic feet.

Every kit contains *Kidde* rate-of-temperature-rise heat detectors, *Kidde* Multijet nozzles, and automatic discharge heads. Pipe and fittings are optional, as are pressure trips and switches, remote controls, sirens, gongs

**pre-engineered**

**any pipefitter  
can install it**



**merely measure the size of the room**



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# Kidde

**Walter Kidde & Company, Inc.**

**1128 Main Street, Belleville 9, N. J.**

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Send today  
for further  
details on  
The New Kidde  
Packaged Fire  
Extinguishing  
System.

## PRODUCT NEWS, cont. . .

tainer. After being pressed, the pre-forms are removed from the mold and subsequently heated to a temperature which will bring about a strong bond between the particles by sintering. Strength can be varied according to the sintering temperature used, highest strengths being obtained by sintering just under the melting point.—*National Polymer Products, Inc., Reading, Pa.*

## Fertilizer, Buckshot Form

**Does away with tendency of the old granular form to absorb moisture.**

Du Pont's Nu Green fertilizer (45 percent nitrogen) now comes in a new form—buckshot-like pellets. The pellets are free flowing and readily soluble because, unlike the old granular form, they do not absorb moisture.

Not only does the new product look like buckshot, it's made like it too. Technical men at the company's Belle, W. Va., works adopted the old shotting process to do the job. In a tower rising more than 100 ft. above the urea plant, raw, molten NuGreen is sprayed into a blast of air and forms into pellets. A big evaporator takes excess moisture from the shot.

Cost of converting to the new system was over \$600,000.—*E. I. duPont de Nemours & Co., Wilmington, Del.*

## Silicon Oxyhydride

**A filler and blowing agent for rubber.**

Under the influence of heat or chemical agents, silicon oxyhydride can liberate 423 cc. of hydrogen per gram. This liberated gas is sufficient to produce a porous foam structure in natural and synthetic rubber gum stock during conventional curing operations. The residual solid is an effective silica filler just like the type usually used to give mechanical strength to the finished products.

Silicon oxyhydride properties also suggest it as: a waterproofing component of greases, creams and similar materials; a catalyst base; a chemical reducing agent; a source of silicon sesquioxide.

When silicon oxyhydride powder is suspended in solutions containing soluble salts of silver, platinum and other metals, the rapid discoloration of the





*How Celite Mineral Fillers give a product better dispersion . . .*



## Making a better "killer" of insecticides



To increase the effectiveness of their product... add more "killing power"—many leading producers of insecticides add Celite Mineral Fillers to their dust as a standard ingredient.

This use of these diatomite powders is based primarily on (1) their light weight and great bulk which improve

dispersion of the poison, and (2) their high absorption capacity that produces dry dust concentrates from both low melting point solids and liquid poisons, thereby increasing the potency of the final product.

These and other unusual physical characteristics adapt Celite Mineral Fillers to numerous industrial uses.

### THESE CELITE PROPERTIES BENEFIT MANY TYPES OF PRODUCTS

Because of their inertness and great bulk per unit of weight, Celite Mineral Fillers make ideal bulking agents for powders and pastes. Their tiny multi-shaped particles interlace to stiffen and strengthen admixtures. The microscopically small facets of these particles diffuse light 'so effectively that they will give any desired degree of flatness to a surface film. And their porous, thin-walled cellular struc-

ture can be utilized to impart a delicate, non-scratching abrasive action.

You may find Celite the "extra something" needed to lift your product above competition. Why not discuss its application to your problem with a Celite engineer? For further information and samples, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto, Ontario.

### CHECK LIST OF PRODUCT BENEFITS OBTAINABLE AT LITTLE COST WITH CELITE MINERAL FILLERS

- Added Bulk
- Better Suspension
- Faster Cleaning Action
- Greater Absorption
- Improved Color
- Better Dielectric Properties
- More Durable Finish
- Increased Viscosity
- Elimination of Caking
- Higher Melting Point
- Better Dry Mixing
- Improved Dispersion



**Johns-Manville CELITE®**

**MINERAL FILLERS**

# Now available a new improved plastic diaphragm...



## "L-2" diaphragms offer new high standards of performance in many severe services

For a wide variety of severe services, including the valving of 66° Bé sulfuric acid, the new, improved "L-2" diaphragm offers physical and service characteristics never before available. Like its predecessor, the "L-1", the "L-2" diaphragm is made of polyethylene specially compounded to provide high resistance to strong acids and other highly active materials.

Hills-McCanna diaphragm valves with "L-2" diaphragms are available with a choice of manual, remote or automatic operators and with bodies of any machinable alloy or with rubber, Neoprene, glass or lead linings. Sizes range from 3/8" through 14". "L-2" diaphragms permit operation at temperatures to 125°F and pressures to 100 psi. Other diaphragms available are Kel-F, Neoprene, rubber, Hycar, Tygon, and butyl. Depending on material, these may be used at pressures to 150 psi, temperatures to 220°F.

Write for complete details. HILLS-McCANNA CO., 2341 W. Nelson St., Chicago 18, Ill.

**HILLS-McCANNA**  
*saunders patent diaphragm valves*  
Also Manufacturers of Proportioning Pumps  
Force Feed Lubricators • Magnesium Alloy Castings

### PRODUCT NEWS, cont. . .

white powder indicates the deposition of reduced metal. Such material may prove to be quite effective for specific catalytic purposes.

Silicon oxyhydride is a reducing agent which may be useful for chemical synthesis. A solid reagent it is capable of control by temperature or alkalinity.

On heating to 900 deg. C. in the absence of oxygen, silicon oxyhydride forms silicon sesquioxide. Similar to silicon monoxide, it may be used as the film coating of mirrors and lenses to increase surface hardness and reduce reflectivity.—Linde Air Products Co., Silicone Products Dept., 30 East 42nd St., New York 17, N. Y.

### Glass-Balloon Aggregate

Strong, light filler gives good insulating qualities to concrete, mortar, plaster.

A new light-weight aggregate consists of tiny glass balloons about the size of grains of sands.

Concrete mixes using it in place of sand or other aggregates are very fluid, even though water content is low. Therefore, contractors can now fill forms with concrete pumped through rubber hoses. Elimination of shovels and metal hose should lower construction costs.

Plaster specimens made with the new aggregate show a compressive strength greater than that of specimens made with sand. The high strength of plaster made with the new aggregate will allow thinner coatings of plaster to be used on walls than are now possible. Plaster board, too, can be made thinner and lighter while retaining adequate strength.

Called Kanamite, the material also has potential application as an ingredient of baked clay products. It should make possible lightweight refractories and high-temperature insulating materials. It has great possibilities as a filler in plastics and road building materials.—Kanium Corp., Chicago, Ill.

### Protective Coating

Resists chemical fumes, food acids, moisture and high humidity.

The inert synthetic resins in a new synthetic coating make it impervious



# PENTEK®

The TOP QUALITY Pentaerythritol  
Makes Better Paints and Varnishes!

Consider these features offered by Heyden Pentek in the manufacture of fine surface coatings:

- Proved performance based on years of leadership.
- Dependable uniformity through rigid laboratory control.
- Increased availability through Heyden's expanded production.
- Economy of time and materials in resin production.
- Superior durability and beauty of finished paint.

If you are making alkyd resins, rosin esters, tall oil esters or drying oils, PENTEK gives them the extra quality you are looking for.

When you formulate with PENTEK, your paints, varnishes, lacquers and enamels have tougher films, increased color and gloss retention, and added resistance to alkali, water and weathering.

Specify PENTEK with confidence! It's made to fill your needs by Heyden, pioneer producer of pentaerythritols. Technical facts, figures and samples available promptly upon request.

PENTEK is packed in easy-to-handle, strong multi-wall paper bags, 80 lbs. net.

## HEYDEN CHEMICAL CORPORATION

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Put the heat on dehydrating problems

A Kirk & Blum Oven removes 900 lbs. of water from 1700 lb. chemical load at Tennessee Eastman Corp., Kingsport, Tennessee.

with a  
**KIRK AND BLUM**  
oven

Specially designed to solve difficult problems . . . KIRK and BLUM Ovens meet any dehydrating needs. The large oven illustrated was built to insure complete removal of moisture as it is taken up by warm air . . . eliminating subsequent deposit on other trays. Four separate compartments each individually controlled for temperature and air circulation in this steam heated oven allows removal of finished loads at any time.

This KIRK and BLUM Oven was shipped completely assembled, thoroughly tested and ready to operate.

It is another example of the diversity of drying problems skillfully solved by KIRK and BLUM engineers. If you have a problem involving ovens . . . feel free to consult with a KIRK & BLUM engineer . . . there is no obligation.

Write for booklet . . . "Industrial Oven". The Kirk & Blum Mfg. Co., 3208 Forrer Street, Cincinnati 9, Ohio.

LABORATORY OVEN . . . electrically heated . . . automatically controlled and timed . . . suitable for test and research . . . or for small production.

**KIRK AND BLUM**  
LABORATORY AND  
INDUSTRIAL OVENS

#### PRODUCT NEWS, cont. . .

to water, acids, alkalis, alcohol, syrups, oils and grease. Because of its elasticity, it will not crack or peel from temperature changes.

For wood, masonry and metal surfaces, the product is tough enough to stand up as a floor coating under heavy trucking and foot traffic. Usable indoors or out, it is recommended for equipment and walls as well as floors.

Called Pozcote, it is available in black, aluminum, clear, white and a complete assortment of colors.—Monroe Co., 10703 Quebec Ave., Cleveland 6, Ohio.

A new silicone resin for Class II electric insulation that maintains its bonding strength and hardness at temperatures 50-90 deg. C. above any known commercially available silicone resin has been developed. Designated as SR-98, the new product is said to permit greater design flexibility in motors, transformers, and generators where vibration is a factor. Because of its excellent bonding strength the lack of flow at elevated temperatures, coils and other rigidly mounted components are held more securely in position than with former silicone resins.—General Electric, Chemical Division, Pittsfield, Mass.

Rapid cleaning of aluminum, anodized aluminum and magnesium parts in power washing equipment is made possible with the development of a new detergent. Known as Kelite PWB, No. 81, it is a powder which is readily soluble in water. It affords complete removal of virtually all types of soil, including Reynolds, Alcoa and Kaiser ink markings in approximately one minute.—Kelite Products, Inc., 1250 North Main St., Los Angeles 12, Calif.

Synthetic rubber latex is now being produced in commercial quantities for use in latex emulsion paints. Marketed to the paint industry as Pliolite Latex 160, the new product is said to give finished paints better scrub resistance, higher film hardness, less odor, excellent film clarity, alkyd compatibility, better particle size and distribution, improved mechanical stability and good brushing and application characteristics.—Goodyear Tire & Rubber Co., Akron 16, Ohio.

—End



*When you need NAPHTHA Solvents  
with a consistently uniform high quality  
and you must have a constant assured supply  
... you'll find the perfect answer in*

# ROOSEVELT

## *Naphthas*

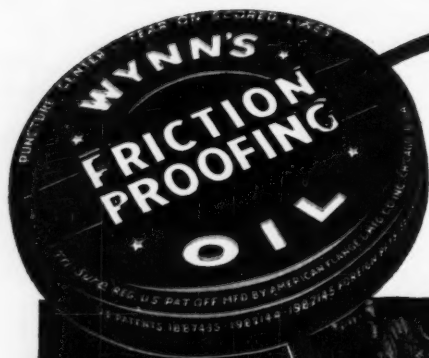
There is no room for uncertainty in modern manufacturing. You must have the right ingredients ... you must be sure of their consistent high quality ... and you must be sure of a constant supply. Because Roosevelt understands the manufacturer's problems, Roosevelt Naphtha Solvents have gained wide acceptance. Modern fractionating facilities which make possible complete catalytic sulphur removal mean non-corrosive, chemically stable solvents with an absolute minimum of offensive odors ... top grade quality! Ample reserves of the same crudes and constant quality control mean that every delivery of Roosevelt naphtha meets your specifications. Finally, Roosevelt Naphthas are delivered where and when you want them.

Roosevelt makes many standard Naphtha Solvents. If your needs are not standard we will make them to your specifications.

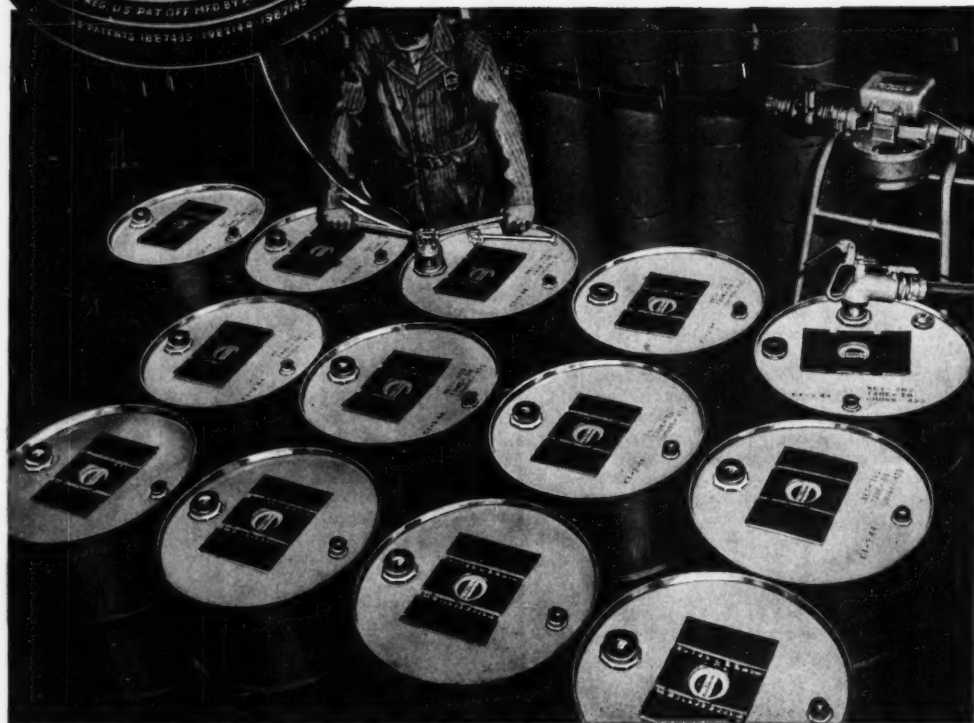


**ROOSEVELT**  
*oil and refining corp.*  
MT. PLEASANT, MICHIGAN





**protected from  
plant to purchaser  
by  
Tri-Sure Closures**



**W**HEN the Wynn Oil Company started producing Wynn's Friction Proofing Oil Additive in 1946, business was conducted in a one-car garage—but the company determined to give all of its drum shipments the most dependable protection obtainable.

Tri-Sure® Closures were selected, and they have been used ever since on Wynn drums—now shipped from a large and modern processing plant on the West Coast.

The Wynn Oil Company exemplifies the scores of oil and chemical companies that have made Tri-Sure protection an inherent part of com-

pany policy. Year after year, these companies *prove* that it pays—in prevention of claims, in greater customer good will—to guard every drum with the Tri-Sure Flange, Plug and Seal.

Give your products Tri-Sure protection—the dependable protection against leakage, tampering, pilferage, and substitution. When you order drums, always specify "Tri-Sure Closures".



\*The "Tri-Sure" Trademark is a mark of reliability backed by 30 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure Dies), Plugs and Seals have been used.

**AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.**  
**Tri-Sure Products Limited, St. Catharines, Ontario, Canada**

# A LONG LIFE and a busy one..

## CASH STANDARD *Streamlined* REDUCING VALVE

TYPE 1000  
PRESSURE

• Long life, and busy too, because this type "1000" valve does not fail—it's as depend-

able when production continues at high rate, like today, as when things are normal. Streamliners in thousands of plants these past years—and still serving well prove this. One user wrote, "We could not afford to take chances on time out for job repairs, that is why we used your valve on this job."

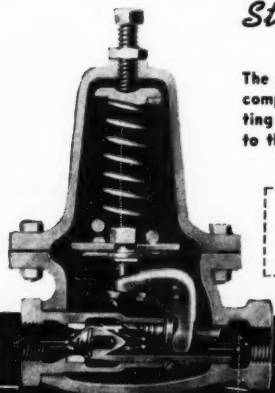
No trouble from lack of capacity with this valve! Even under peak load, or sharp changes in demand, the aspirating effect gets the valve wide open for maximum flow. Users know this and will vouch for it.

Write today for Bulletin 1000—eight pages of valuable valve facts.

### Streamline Design means

#### LESS MECHANISM

The elimination of small ports and passages and complicated mechanism with but few close fitting parts gives you more in service and adds to the life of the "1000" valve.



*Streamlined*  
FOR SMOOTH, EVEN  
FLOW OF STEAM,  
WATER, AIR, OIL, ETC.

#### NET RESULT TO YOU

Maximum Capacity When Needed Most • Accurate Pressure Control Under Toughest Working Conditions • Trouble-Free Service • Smooth Operation • Tight Closure • Accurate Regulation • Speedier Production Results • Elimination of Failures • Constant Delivery Pressure • Cost Saving Operation • No Spoilage • Practically Zero in Maintenance Costs.

#### TURBULENCE ELIMINATED

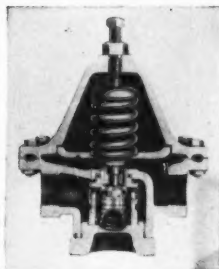
The streamlined form of the inner valve produces the flow pattern shown here. It is the reason users of the "1000" valve get maximum capacity when it is needed most and accurate pressure control even when production hits non-stop proportions and operating conditions really are tough.

**CASH STANDARD**  
CONTROLS..  
VALVES

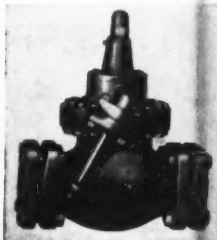
**A. W. CASH COMPANY**  
DECATUR, ILLINOIS

**BULLETINS  
AVAILABLE  
ON OTHER  
CASH STANDARD  
VALVES**

*Send for them*



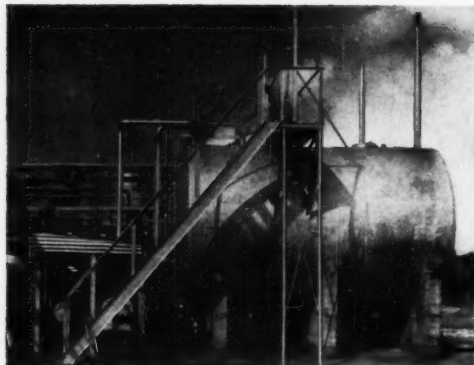
Bulletin 950—features the CASH STANDARD Type 950 Single Seal Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



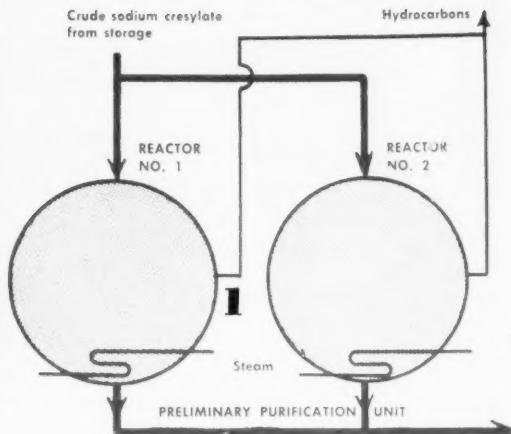
Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve—designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.



**I** Preliminary purification unit handles the cresylic acid crudes, which are petroleum fractions from the refineries. Neutral hydrocarbons are removed.



# Cresylic Acid



Cresylic acid, phenol and cresol mixtures are among the important products of the Greens Bayou Plant of the Merichem Co., Houston, Tex. Independent producers of sodium sulphide and paraffin waxes, the Merichem Co. constructed their cresylic acid unit at the Greens Bayou Plant in early 1949 in order to supply raw materials for the manufacturers of modified phenolic resins, tricresyl phosphate, lubricating oils, carbon-stripping compounds, plastics, paint removers, dyestuffs, pharmaceuticals, disinfectants, flotation reagents and wire coatings.

Petroleum fractions from refineries constitute the raw material for the phenols, cresols, and xlenols which make up the products of Merichem's cresylic acid unit. However, cresylic acid crudes (the general name used to denote mixtures of phenols, cresols, and xlenols) as taken from refineries require exhaustive processing before a high-purity product is obtained.

Basically, the processing of cresylic acid consists of neutralization, purification and refining. Various steps involved are outlined on the accompanying flow sheet.

Crude petroleum acids are received at the Greens Bayou Plant as a caustic solution of the phenols, cresols, and xlenols. Consequently, the raw material is an aqueous solution of the sodium phenolates, cresylates, and xlenates. This aqueous solution, generally termed "sodium cresylate", is transferred from storage tanks to reaction vessels for preliminary purification. At the same time, neutral hydrocarbons, which are immiscible with the aque-

ous cresylate solution, are removed by physical means from the cresylate.

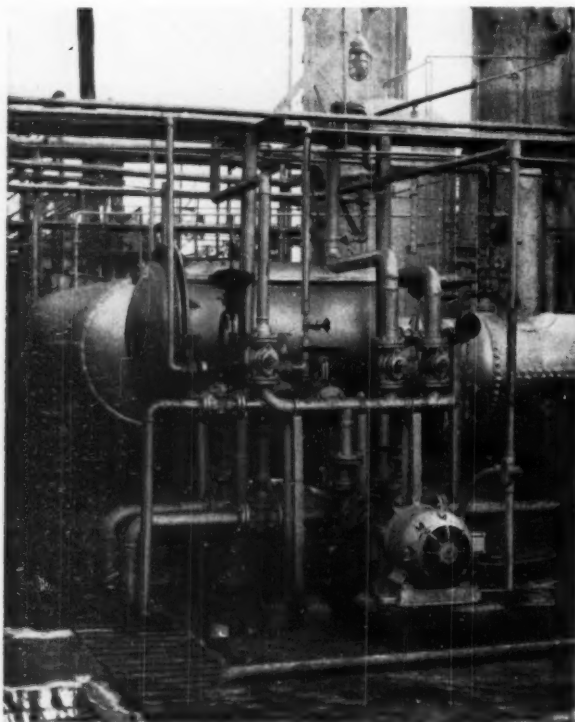
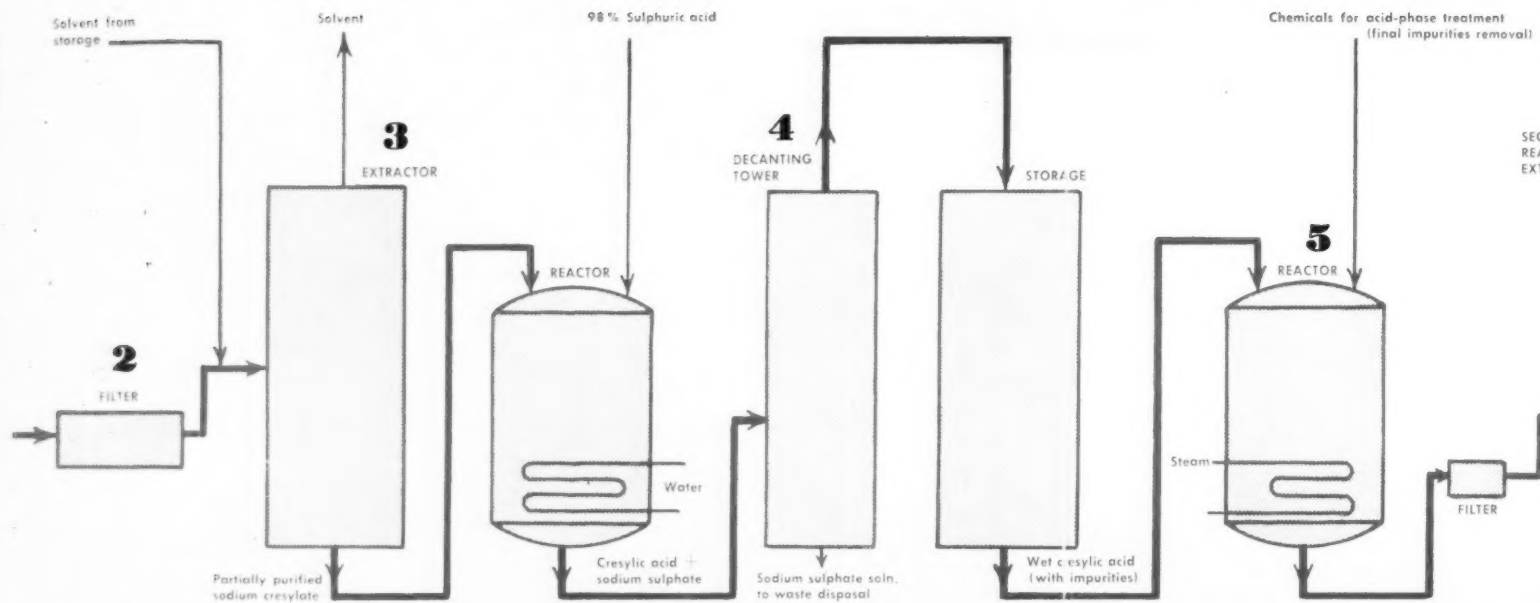
After hydrocarbon removal, the sodium cresylate solution is filtered and solvent-extracted to remove additional impurities.

The partially purified sodium cresylate from the solvent extraction is treated with sulphuric acid. The chemical reaction is the neutralization of the NaOH and the freeing of the phenols, cresols, and xlenols from their sodium salts. The reaction vessel is a stainless steel, turbine agitated vessel equipped with stainless steel cooling coils and automatic temperature controls.

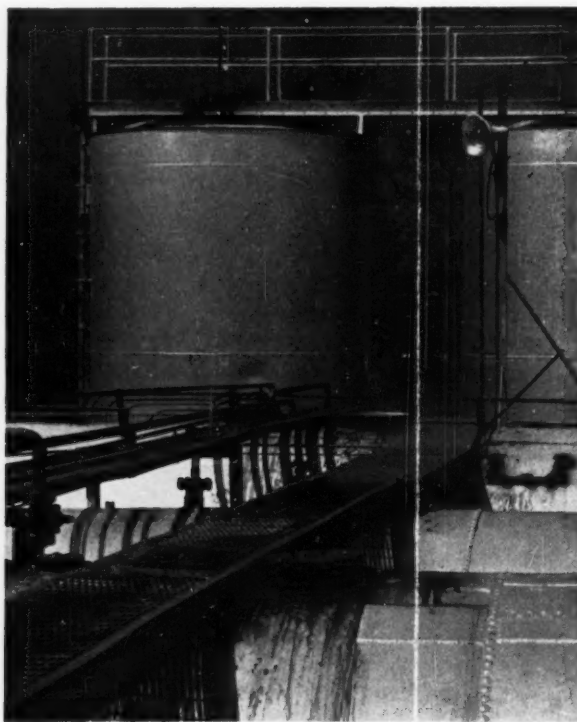
Sulphuric acid treating produces a sodium sulphate solution as a byproduct.

Following the acid treatment, the wet, partially purified cresylic acid is piped to storage facilities and then to a final, acid-phase treatment for the removal of remaining impurities. Once the last traces of impurities are removed, the wet cresylic acid is fractionated in a continuous distillation column.

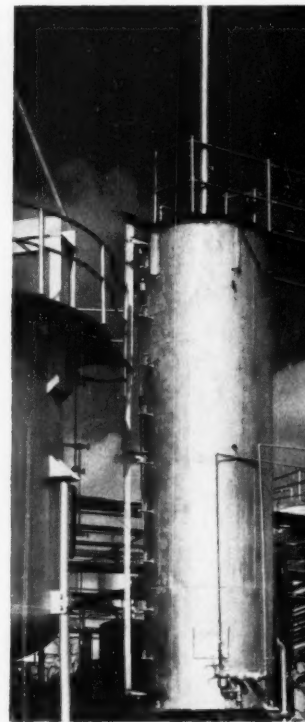
The distillation separates the cresylic acid into two fractions: (1) an overhead product consisting of phenols and cresols, and (2) a bottom fraction consisting of cresols and xlenols. The exact composition of the two products is controlled by the operating conditions of the distillation unit. Depending on the use for which the products are destined, the distillation conditions are varied to give individual consumers the most satisfactory material for the use.



**2** This Monel pressure leaf filter and accessory equipment handle the sodium cresylate solution after hydrocarbon removal.



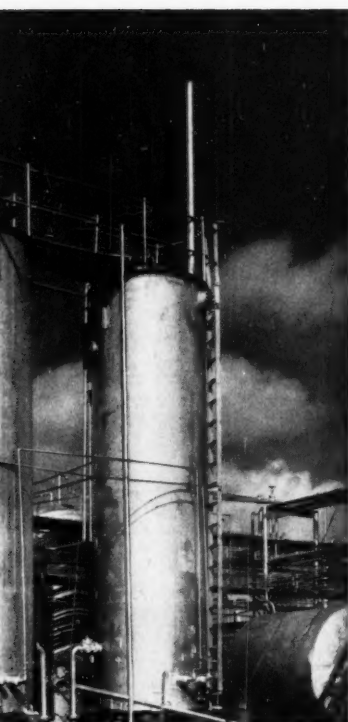
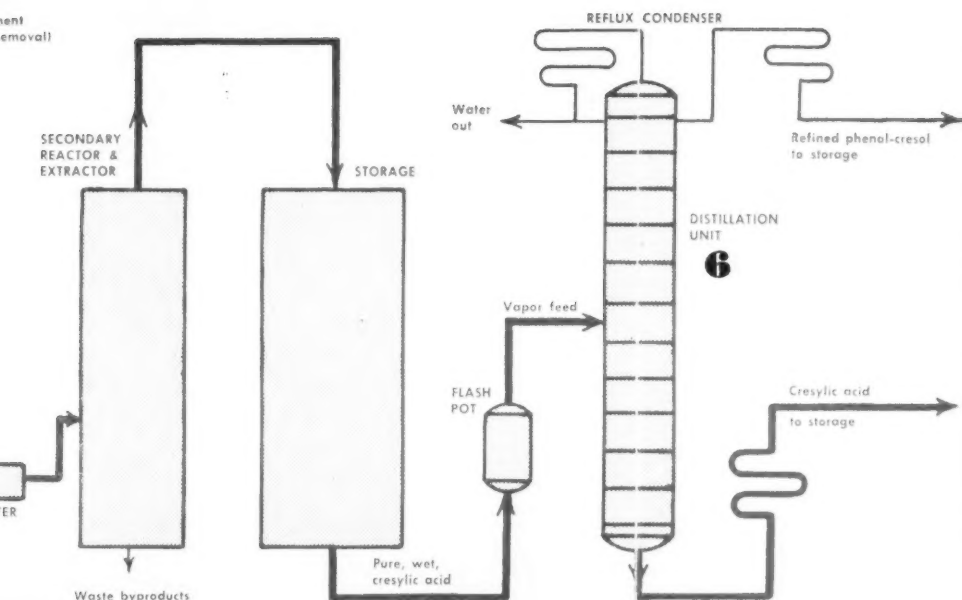
**3** Solvent extraction unit which removes additional hydrocarbon impurities, these being byproducts of the process.



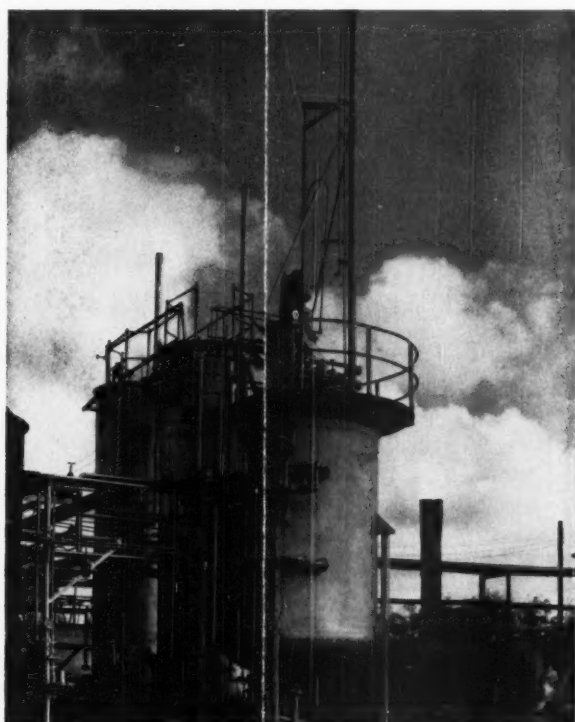
**4** Decanting towers which separate the reaction formed by the sulphuric acid



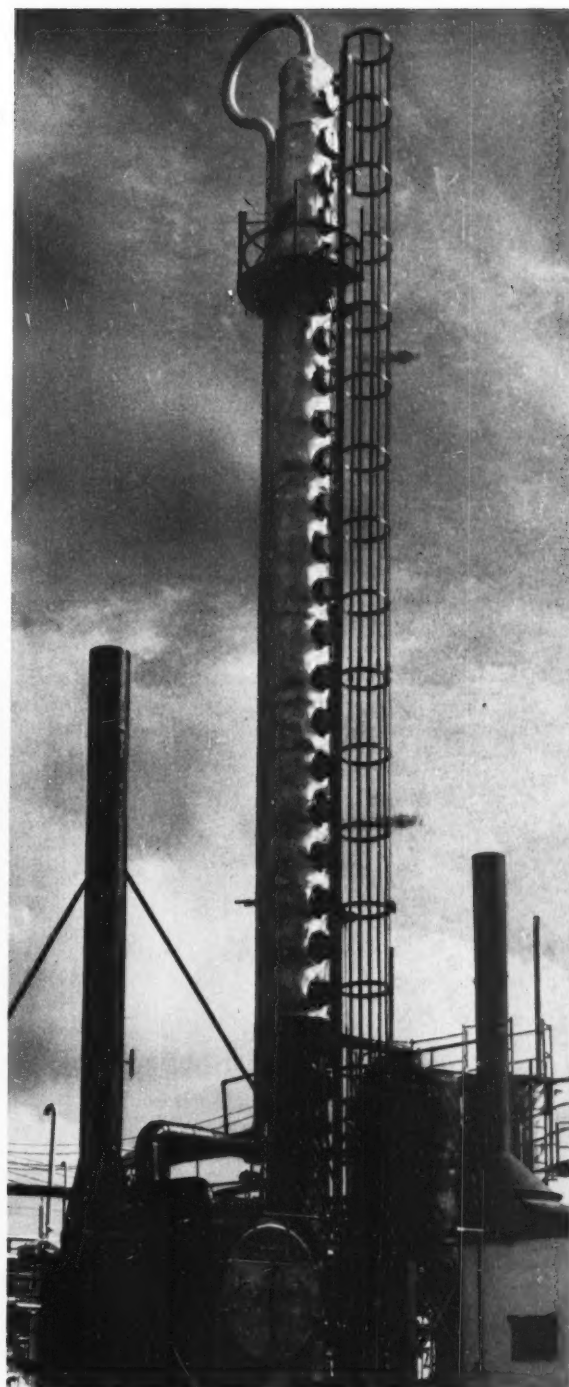
ment  
removal)



Separate cresylic acid from sodium sulphate solution by acid treatment.



5 Mechanically-agitated stainless steel reactor for final impurities removal. This is an acid-phase treatment.

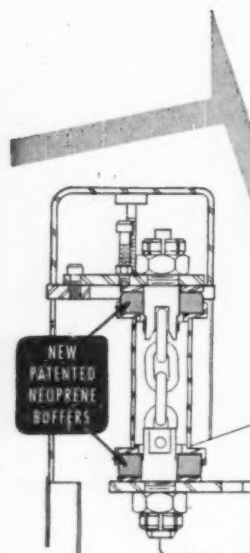


6 Continuous distillation unit for the fractionation step. Refined cresylic acid, phenols, and cresols are the products.



# NEW Centrifugal

## SAVES TIME AND LABOR



IMPROVED PEDESTAL DESIGN CONTROLS VIBRATION



### FEWER STOPS to rearrange load

Tolhurst "Center-Slung" Centrifugals, long famous for their exceptional stability, have now been re-designed to handle even greater out-of-balance loads.

Tolhurst "Center-Slung" Centrifugals have the case suspended by flexible chain links so that the revolving mass is free to find its own center of gyration, resulting in unusually smooth operation. Now, the chain links are housed in grease-packed metal sleeves and are mounted top and bottom in neoprene buffers to absorb vibration. Tests show that this improved Tolhurst "Center-Slung" can handle out-of-balance loads 3 to 4 times greater than ever before. Less care is needed in load-

ing the basket and fewer stops are required to redistribute the load.

Other improvements include mounting the spindle in roller and double row ball bearings in a new type of tubular housing, a slanting case bottom for faster, more complete drainage, a new self-energizing brake and more compact motor mounting.

Machines are available with split cover or full cover and can be fumetight construction. Basket, case and cover can be constructed of any practicable material, as specified. Single speed or two-speed motor drive, or infinitely variable speed hydraulic drive available. Basket sizes, 12" through 108" in diameter.

Write for complete details

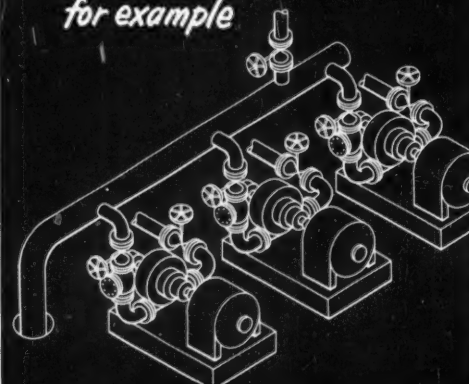


## Tolhurst CENTRIFUGALS DIVISION

AMERICAN MACHINE AND METALS, INC.  
EAST MOLINE, ILLINOIS

# Can You Trust to Hold Like This?

...on Water Pumps,  
for example



THE INSTALLATION

Crane Iron Body Swing Check Valves in 8-inch vertical lines on discharge side of water pumps supplying a large eastern paper mill.

### THE HISTORY

The mill depends on these pumps for all water. Loss of head at the pumps would create a serious problem. The mill could take no such risks. Regularly, the check valves on pumps were replaced, but only to be found leaking between pumping cycles, a few months later.

It's now more than a year since the change-over was made to Crane Check Valves. There's been no loss of water, no maintenance or replacement of any checks on the pumps. That was proof enough for the mill, that Crane Quality means better valves—greater dependability and bigger value. As a result, 3 more of these checks were installed on a separate battery of suction pumps.

The Complete Crane Line Meets All Valve Needs. That's Why  
More Crane Valves Are Used Than

# CRANE VALVES

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CHEMICAL ENGINEERING—November 1952

# Test Your Checks

## ? VALVE SERVICE RATINGS

### SUITABILITY:

*Working smoothly - no complaints*

### FEATURES:

*OK for either horizontal or upward flow*

### MAINTENANCE COST:

*None - no maintenance needed to date*

### SERVICE LIFE:

*Now better than other checks used*

### OPERATING RESULTS:

*No water or head loss*

### PRICE:

*In line with other makes*

### AVAILABILITY:

*Stock item - Crane product*

## THE VALVE

Crane No. 373, 125-Pound Iron Body Swing Check Valves, brass trimmed. The long life and high seating efficiency of these checks, in 2 to 8-in. sizes, is in large part due to the Crane patented flexible disc-hinge design. Double spring mounting eliminates lost motion between parts, yet permits true, full contact of disc and seat at every closure. Also serves to absorb the shock of seating under back-flow pressure. See your Crane Catalog or Crane Representative for full details.



Why  
Used Than Any Other Make!

# VALVES

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PUMPING • HEATING

217



THE use of a standard Raymond Mill with Flash Drying accessories offers you a proven method of producing powdered materials to meet today's exacting specifications. Consider these profitable advantages:

### BETTER PRODUCT:

Uniformity of finished material through close control of particle size and moisture content  
Higher quality of finished product than can be produced on dryers having longer time elements.

### LOWER COST:

Drying and grinding combined in one operation . . . automatic and dustless . . . without use of separate dryers or conveyors.  
Shorter production time; high heat efficiencies.  
Ease of installation; minimum floor space; and plant simplification.  
Low upkeep expense.

Raymond Flash Drying Mill Systems are available in a wide range of capacities for handling a variety of products. Write for detailed information.

RAYMOND  
Flash Drying  
CATALOG No. 54A

This Catalog describes the use of Flash Drying with the Raymond Roller Mill, Imp Mill and Cage Mill.

## COMBUSTION ENGINEERING - SUPERHEATER, INC.

# Raymond

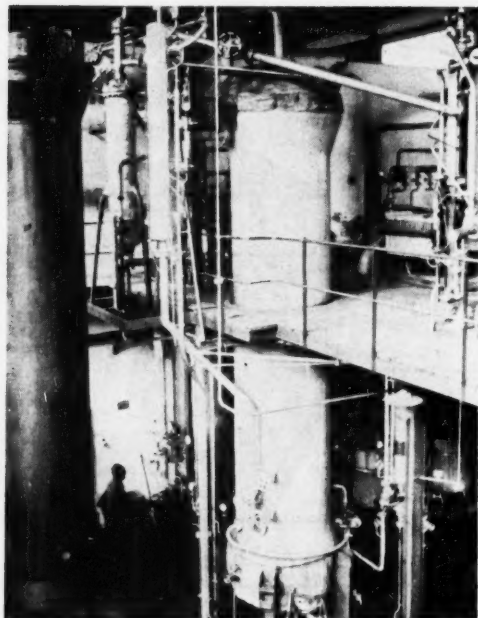
PULVERIZER DIVISION

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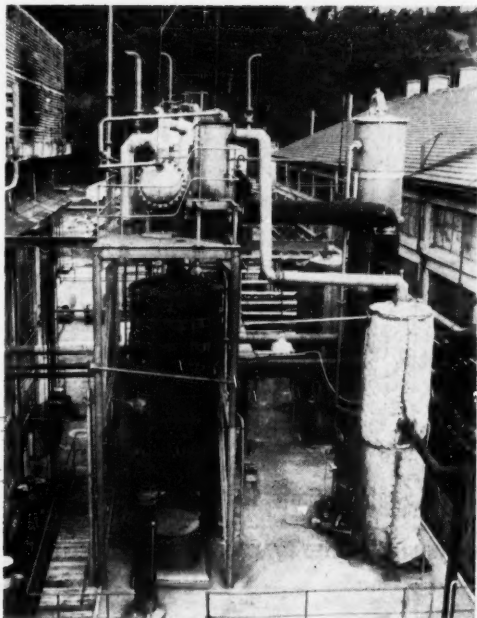
SALES OFFICES IN  
PRINCIPAL CITIES

218

November 1952—CHEMICAL ENGINEERING



SYNTHESIS section of Hovag's 15-ton urea plant.



GAS RECOVERY section is located outdoors.

### Swiss Solve Urea Problems

**New alloy for reactor construction, new selective absorbent for separation of recycle gases are the keys to process economies in new synthetic urea process.**

America is importing more from Switzerland these days than watches. A new Swiss synthetic urea process, involving important improvements over present-day technology, is currently being introduced on this side of the Atlantic by Vulcan Engineering Div. of the Vulcan Copper & Supply Co., well known Cincinnati engineers and fabricators. The process comes by way of Inventa, A. G. of Lucerne.

The process was developed by Inventa's affiliated company, Holzverzuckerungs A. G. (Hovag) of Ems, Switzerland. Hovag has been operating a small commercial plant since 1949. Output is approximately 15 tons per day of crystalline urea of plastics and pharmaceutical grade.

Vulcan's role to date has been translation of the process to American de-

sign requirements along with preparation of estimates of capital and operating costs. Under license from Inventa, Vulcan will grant sub-licenses to urea producers using the process in United States and Canada.

The Inventa process follows the pattern of other commercial urea processes in that synthesis is based on reaction of ammonia and carbon dioxide under high pressure to form ammonium carbamate, with subsequent decomposition of carbamate to urea.

► **New Alloy**—Extreme corrosive conditions in the reactor (200 atm. and 360 deg. F.) require special consideration. Other processes use lead or silver construction, but it seems that corrosion is still a major problem.

The Swiss group has developed an alloy which is said to be highly re-

sistant to these conditions. Just what this alloy contains can't be revealed until certain patent matters are cleared.

The alloy can be described now only as an unusual modification of a conventional material. It does not contain silver or lead. It is easily fabricated—the reactor is lined with this alloy and also contains an internal heat exchanger consisting of tubes made of this material. It is available in the U.S. and is said to be reasonable in cost.

In addition to lower maintenance, the new alloy contributes another important process advantage—high-purity urea, suitable for cattle feed, is obtained without recrystallization because of the absence of metallic contamination.

► **New Recycle Step**—Like other urea processes, conversion of ammonia and CO<sub>2</sub> in the reactor is only about 50 percent. Economic operation requires that the ammonia value be recovered (e.g., as ammonium sulphate) or that the gases be recycled.

The method of recycling is the major distinction between various proc-



Ammonia is by far the most important item in manufacturing cost. Theo-





Your North American tank car works day in and day out, year after year, never stopping but to load and unload your products and for maintenance. Here's truly a business partner worth many times its keep . . . the strongest member of any chemical shipper's team. And today, with a critical shortage of specialized tank cars, your North American partner is working harder than ever . . . keeping on the go every possible minute to meet the tremendous demands of the growing chemical industry. Remember—on the rails and in its offices, North American is your partner for fast, economical transportation and helpful, experienced shipping advice.

*For Special Products Requiring Special Care*

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retically, 57 lb. of  $\text{NH}_3$  is required to make 100 lb. of urea. Vulcan figures on an actual consumption of 58 lb., representing an over-all yield of about 98 percent.

Maintenance is estimated at a modest 4 percent per year on investment. This figure seems low for this type of operation but is based, no doubt, on the special reactor alloy and on the use of Types 304 and 316 stainless steel elsewhere in the process.

Utility requirements per ton of product are estimated as follows: Steam, 7,200 lb. at 200 psi.; cooling water, 48,000 gal. at 80 deg. F.; process water, 450 gal.; electricity, 520 kwh. at 2,300 v. (or 67 kwh. plus 4,500 std. cu. ft. of 1,000-Btu. fuel gas if compressors are engine-driven).

Low steam requirements are made possible by recovery of the exothermic heat of reaction from the synthesis step. Approximately 0.85 lb. of steam is produced, for use elsewhere in the plant, per lb. of urea synthesized.

### Pot Stretching Adds Capacity To Produce Vital Aluminum

At its Longview, Wash., plant, Reynolds Metals Co. has boosted capacity from 60 million to 100 million pounds of pig aluminum per year. This was done by enlarging the Longview plant's three lines of 372 reduction pots.

The pot structures were trucked individually to a Swan Island, Wash., firm for fabrication. There they were rebuilt by cutting them in two and welding in joining sections—thus in effect "stretching" the pots to give greater capacity. They were then returned and installed in the original buildings. All three of the rebuilt potlines are now in operation, according to plant manager H. W. Shoemaker.

Reynolds will purchase more electricity from the Bonneville Administration to feed the plant's expanded aluminum-making cells—an increase from 66,000 kw. to 100,000 kw. Current flowing through the pots has been raised from 32,000 to 54,000 amp. The structures housing the pots are 740 ft. long and have not been enlarged.

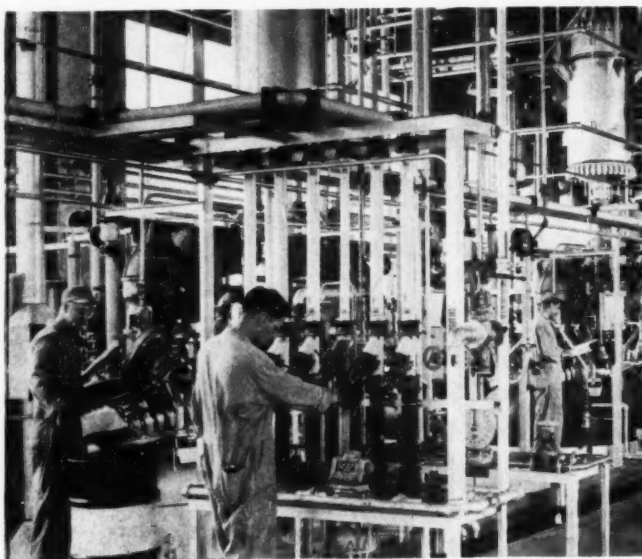
The expansion operation began in February 1952. Even during the process of enlarging the pots, production was kept at more than 50 percent of

the plant's original capacity. Cost of the increased capacity is about \$7 million.

This project at Longview completes the first phase of a program by Reynolds to cooperate with the government in boosting the nation's aluminum production. In this first round of expansion, Reynolds built the San Patricio plant near Corpus Christi, Tex., with a capacity of 160 million pounds yearly; added 50 million pounds to the capacity of its Jones

Mills, Ark., plant and 40 million pounds at Longview—a total of 250 million more pounds of vital aluminum pig yearly.

Heeding the government's call for a second round of expansion, Reynolds is now building the Robert P. Patterson reduction plant near Arkadelphia, Ark., with a capacity of 110 million pounds annually; and the La Quinta alumina plant near Corpus Christi, with a yearly output of 730 million pounds of alumina.



## Merck Cuts Cortisone Price

A 40 percent reduction in the price of cortisone followed the start of production at the new Cherokee plant of Merck & Co., Inc., at Danville, Pa. The price reduction is made possible by greatly increased supplies of cortisone at reduced manufacturing costs.

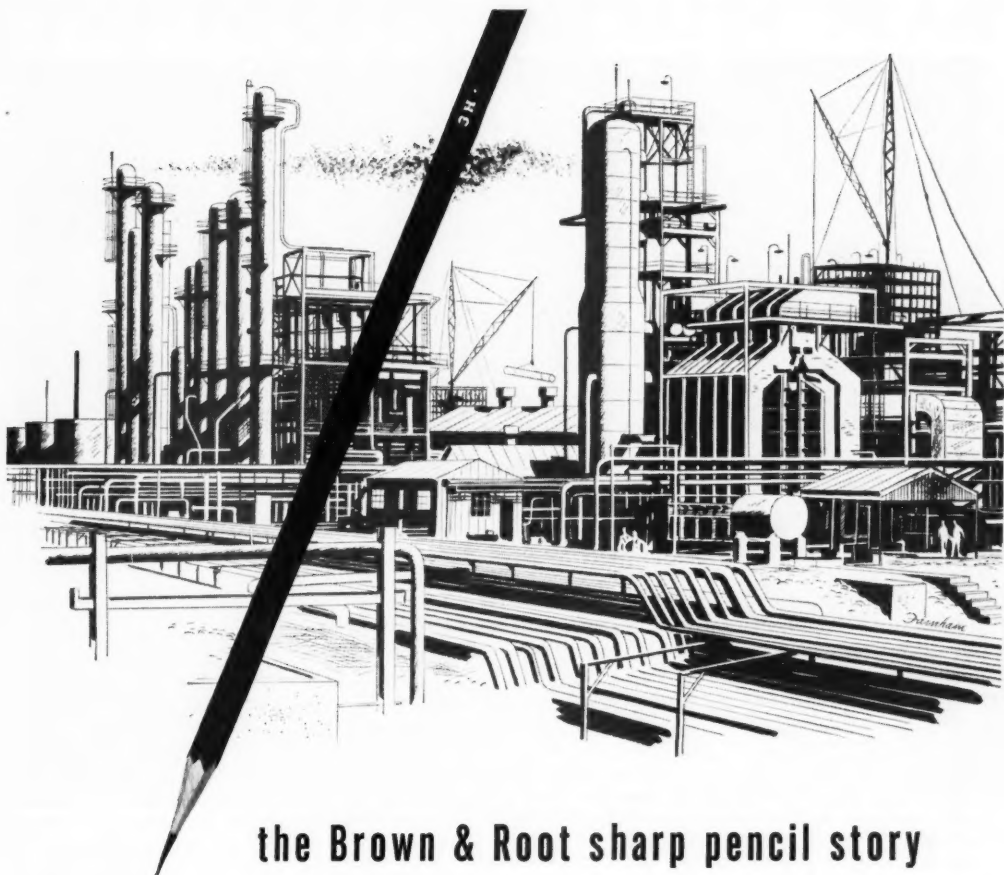
Shipments of Cortone, the Merck brand of cortisone, from the Cherokee plant climaxed an 18-month construction project. The new unit more than doubles the company's production capacity for cortisone.

"In keeping with our policy," says President James J. Kerrigan of Merck, "the savings in manufacturing costs are being reflected in a reduction of 40 percent in the price of Cortone.

This is the ninth reduction and brings the price to less than one-tenth of the initial price in the fall of 1949.

"We are also reducing the price of Hydrocortone, the Merck brand of hydrocortisone acetate," says Kerrigan. "Our Cherokee manufacturing unit," Kerrigan adds, "will enable us to produce increasing supplies readily as they are needed."

Merck began construction of the new cortisone plant at Cherokee shortly after December 1950. Meanwhile, Merck continued to increase production at its Rahway, N. J., plant. Output from Cherokee will not only swell the U. S. supply but will make substantial quantities available for export to friendly countries.



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is staffed by men of highest loyalty and integrity. They get the job done without costly delays.

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EQUATIONS INTO CODE



CODE INTO RESULTS

## Calculator Solves Fluid Flow Problem

**Many problems of theory have lain dormant for years because it took a lifetime of calculating to solve them. But computers are changing that. Here's a case in point.**

Columbia University recently announced that an answer had been calculated to settle a 64-year-old problem about the stability of plane Poiseuille flow.

This work proves mathematically that fluids of low viscosity when moving rapidly enough become unstable without any outside influence. It upsets the opinion of William Kelvin, English physicist, and many other theorists in the field of fluids mechanics that some finite, outside disturbance, such as surface roughness, must be introduced into plane Poiseuille flow to make it turbulent.

Result is that one obstacle has been removed from the job of obtaining a good theory of turbulent motion in flowing fluids. Such a theory, if ever developed, would be a big help in the design of all kinds of process equipment. Today, most designs come from laborious accumulations of empirical data.

► **Rapid Calculation**—But there is another—equally significant—side to Columbia's announcement. That was the word that the job had been done by International Business Machine's selective sequence electronic calculator. This instrument's 12,500 vacuum tubes telescoped 100 years of hand computation into 150 hours of machine operating time, making some

20 million individual calculations.

An experimental solution to the problem is almost impossible since you can't set up the ideal conditions of continuous fluid flow and still be sure that you haven't introduced an outside disturbance. Three or four years ago mathematicians came close to an analytical solution when a numerical approach for the "simple, ideal case" was suggested by Dr. John von Neumann of the Institute for Advanced Study at Princeton, N. J.

At that time, a solution was attempted for the first time on the SSEC. But, probably because of coding difficulties, von Neumann and associates couldn't get Reynolds numbers any higher than 1,600, so the controversy was still not settled.

The contribution of the staff of the Watson Scientific Computing Laboratory at Columbia was a solution for the complex eigen values of the Orr-Sommerfeld equation.\* Then the equations were adapted to the giant calculator by Phyllis K. Brown and Donald A. Quarles, Jr., of IBM's pure science department.

The numerical answer is that plane Poiseuille flow becomes unstable at a Reynolds number of about 5,800. For the case of a fluid flowing at uni-

form speed between two parallel plates, Reynolds number is defined as  $U_0 l / \nu$ , where  $U_0$  is the velocity of flow halfway between the plates,  $l$  is the distance between plates, and  $\nu$  is kinematic viscosity.

► **Significance**—With regard to the implications of this work, the man who directed it, Dr. L. H. Thomas, Professor of Physics at Columbia, says:

"This takes care of a very difficult problem. So far, we have no accepted theory of turbulent motion and how it sets in, though we do have a great deal of empirical data. The trouble is that theorists haven't been able to push beyond present data with certainty—they are not sure what would happen in some of the simplest cases of fluid flow. To work out some of these problems without computation takes very troublesome mathematical analysis. Before we had such machines as the SSEC, we were incapable of handling such complex problems by direct computing.

"Our results have fortunately settled some current arguments in hydrodynamics—specifically they support the work of Prof. C. C. Lin of the Massachusetts Institute of Technology who was able to arrive at some similar results using asymptotic formulas.

"We hope that the solution to this problem in hydrodynamics will open up the way to dealing with other relatively simple problems which have also resisted solution. Naturally, we hope results of this kind will help develop a good theory of turbulent motion."

\* In the *Physical Review* for June 1, 1952. The complete paper is to be published at a future date.

# THE FOURTH DICALITE PLANT



...will add approximately 80% increased production capacity for Dicalite calcined and processed filteraids and fillers

The new plant of the Dicalite Division, Great Lakes Carbon Corporation, at Lompoc, Calif., is now in volume production at a continually increasing rate. It represents over 5 years of engineering, design and construction, and is the largest complete unit for processing diatomite built in the last 22 years. Full designed output will add approximately 80% increased production capacity for Dicalite calcined and processed filteraids, fillers and other materials.

The timing is fortunate in view of the emergency

situation in the supply of diatomaceous products. Four Dicalite plants are now running 24 hours a day to produce the maximum tonnage of Dicalite materials.

Advanced design of the new plant has afforded greater operating flexibility. Even during this extreme pressure for volume production, specifications for performance and quality of each product are readily maintained. Research data are being accumulated to aid in developing new and improved Dicalite products for future industrial use.

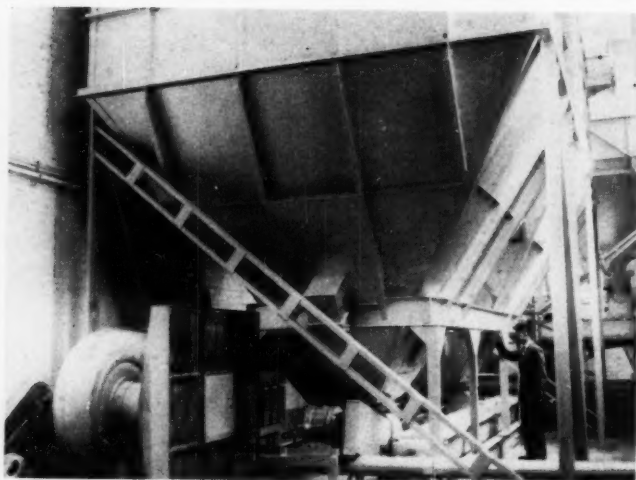
## DICALITE DIVISION

GREAT LAKES CARBON CORPORATION



NEW YORK 17 • CHICAGO 1 • LOS ANGELES 17





**BLOWER** at left forces filtered air up through sugar stored in 100-ton bin, conditioning it so that it will not become lumpy or cake.

## Sugar Moves in Bulk

**Blowing with air keeps granulated sugar free-flowing, makes possible bulk handling with its attendant savings for both producer and consumer.**

Up to 200 tons per day of bulk granulated sugar is now being shipped to Pacific Coast industrial consumers from California and Hawaiian Sugar Refining Corp.'s Crockett, Calif., plant. The \$200,000 bulk-handling installation, started two years ago, was strike-bound shortly after it went on stream in July 1951, but finally reached full capacity this summer. C&H claims that this installation is the most modern of its type in the country.

Granulated sugar is favored in bulk form by certain industrial users because it is handled in a closed system (more sanitary), eliminates packaging cost, reduces handling expense, cuts down storage requirements. Industrial use of bulk sugar is relatively new in the West, however; there the first shift from packaged to bulk sugar occurred only 2½ years ago.

Cost of granulated sugar in bulk form is 15c. less per 100 lb. than it would be if packaged in 100-lb. bags. An additional 15 to 35c. per 100 lb. is saved by the consumer in his plant.

► **Aeration Prevents Caking** — Main feature of the new installation is the special equipment used to condition

the sugar so that it will not cake or become lumpy in transit or in storage. This conditioning is accomplished by aeration; large volumes of filtered air are blown through the sugar while it is held in a 100-ton storage bin and again as it passes through one of two 25-ton scale hoppers. Chief effect of aeration: Removal of minute traces of moisture that cling to the sugar crystals as they come from the refining process.

Delivery of the conditioned sugar to industrial users is made in hopper trucks which can carry more than 20 tons each. Facilities for hopper-type rail cars have also been included at Crockett.

The time required for conditioning is the capacity-limiting factor of these new units. Whereas the old system required eight men to package and ship about 120 tons per 8-hr. shift, the new bulk-loading unit requires only minor attention from three men to control the conditioning and shipping of about 67 tons per shift.

Bulk dry sugar competes, of course, with sugar syrup transported via tank trucks. Syrup is cheaper but can't be used in some food processes.

## Allied Stepping Up Output Of Ammonia and Methanol

Construction is moving ahead rapidly on the new methanol plant of Allied Chemical & Dye Corp. at South Point, Ohio. The new plant replaces existing methanol facilities at South Point, and is expected to start production in the spring of 1953.

Ammonia production at the plant will also be increased. Originally, the South Point plant was laid out with four units for production of ammonia. However, it was necessary to use one of these units for methanol production. Construction of the separate methanol plant will now make it possible to use all four units for ammonia production as originally planned.

Increased ammonia output will enable the South Point plant to meet its own requirements and to produce more urea for feed and fertilizer use.

Major uses of methanol are in formaldehyde manufacture and as an antifreeze. Formaldehyde is used in the production of synthetic resins, ethylene glycol and pentaerythritol.

Added methanol and ammonia production at the South Point plant, which is operated by Allied's Nitrogen Division, will benefit not only other manufacturers but will supply Allied with necessary raw materials. More methanol, for example, means more formaldehyde for ethylene glycol, which Allied's Organic Department plans to manufacture.

## Lithium Plant Will Double U. S. Output of Light Metal

Construction has been started by Blaw-Knox Co. on the new lithium processing plant of Foote Mineral Co. at Sunbright, Va. Together with two other projects being undertaken by Foote, the mining of lithium ore and the processing of limestone, it will double the nation's output of lithium.

Demand for lithium, both for defense and civilian uses, has skyrocketed. This lightest of metals is used to produce all-purpose greases for high operating temperatures. It's also used in the production of ceramics and cosmetics, and in the glass industry. Blaw-Knox expects to have the new lithium processing plant ready to run within a year.

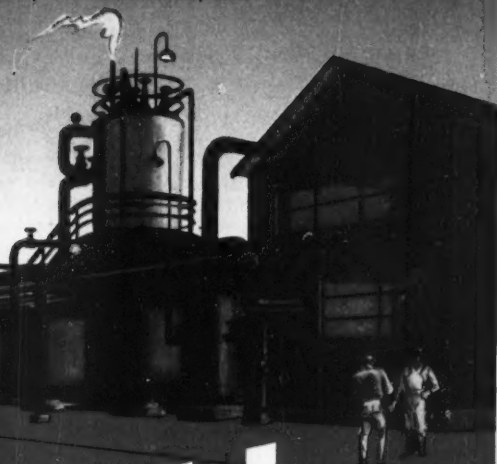
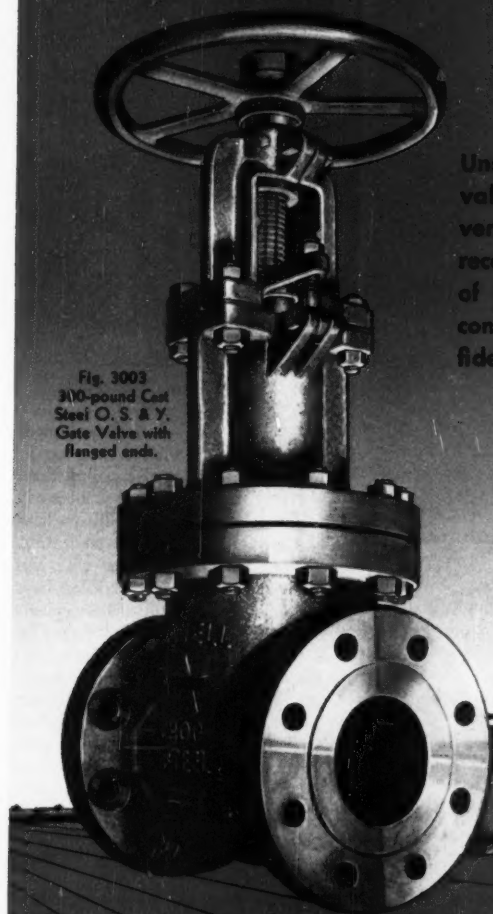


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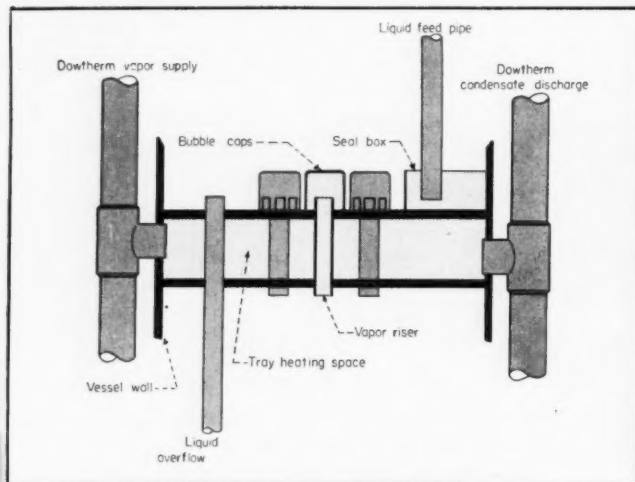
Fig. 3003  
310-pound Cast  
Steel O. S. & Y.  
Gate Valve with  
flanged ends.



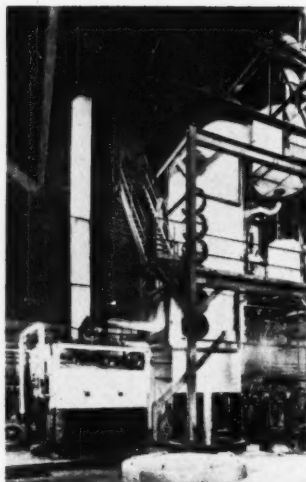
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HOLLOW BUBBLE TRAYS are heated by Dowtherm vapor.



DOWTHERM heater feeds still.

## Novel Still Design Pays Off

**Starting with a column of hollow trays, Wurster & Sanger has developed a continuous distillation unit that gets more and better refined fatty acids.**

A growing list of buyers testifies to the virtues of a continuous simple distillation plant for refining fatty acids. Catering to the heat sensitivity of these materials, this plant uses a novel still-heating method which makes it practical to distill under vacuum without heating above vaporization temperature. In addition, time of exposure to vaporization temperature is held to a minimum.

Cutting down on time and temperature in this way gets the best yield of product by reducing the amount which polymerizes to tars or cracks to hydrocarbons.

► **Satisfied Customers**—First full-scale commercial unit was installed in 1946 by A. Gross & Co., Newark (N. J.) producer of high-quality distilled fatty acids. In 1950 Gross put in a twin of this 4,000-lb. per hr. unit.

Construction has started recently on a 1,500-lb. per hr. unit for a Brazilian producer, Companhia Luz Stearica. In addition, Darling & Co. (Chicago) plans to put in a 4,000-lb. per hr. unit soon.

► **Hollow Trays**—Developed by Wurster & Sanger, Inc., of Chicago, the distillation plant centers around a six-

tray bubble-cap column featuring a novel method of supplying heat of vaporization to the fatty acids. Underneath each tray is a hollow chamber into which Dowtherm vapor is passed (see cut).

Dried and deaerated feedstock enters at the top, begins its descent through the column. At the temperature and pressure in the column (400 deg. F. and 5 to 10 mm. Hg), most of the fatty acids vaporize before the non-volatile residue passes out at the bottom. Time of exposure varies from less than a minute for the acid vaporized on the top tray to about 30 min. for the residue. Average time in the still is about 10 to 15 min.

Highest surface temperature to which the material is exposed is in the range of 525 to 625 deg. F., with Dowtherm pressures of 8 to 35 psi. This is said to be a big improvement over the direct-fired pot still, in which distillation temperatures reach 500 to 550 deg., surface temperatures approach that of the furnace, and exposure time sometimes runs 24 to 48 hrs.

It also beats a flash still, in which you have to preheat the feed to 575

deg. to provide heat for subsequent vaporization, and the recycling usually required adds to total exposure time. Previous applications of bubble-tray columns to fatty acid distillation have also used high-temperature preheating. ► **Integrated Unit**—Starting with this improved still, W & S engineers have designed complete distillation plants in capacities of 500 to 5,000 lb. per hr.

Conditions in the still require that the feedstock be dry and free of air-dry because varying amounts of water would cause entrainment and may lead to instability in the vacuum equipment; deaerated to reduce oxidation losses. So, operating at 150 to 200 deg. F. and 26 to 28 in. of vacuum, a dryer-deaerator polishes off the pretreatment without harming the sensitive fatty acids.

Vapor from the column goes to a centrifugal entrainment separator which removes all but 0.03 percent of entrained liquid.

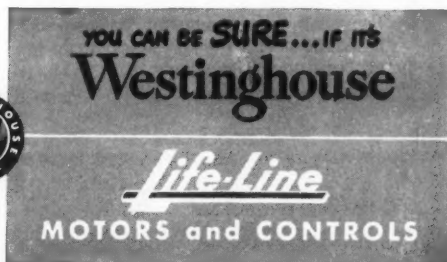
Next are two tube-and-shell condensers of special design. Many fatty acid mixtures solidify at 110 to 130 deg., ordinarily requiring the use of tempered water to prevent fouling up the condensers. W & S reports that with careful condenser design and temperature control you can use direct cooling with water temperatures as low as 70 deg. The same principles apply to the product coolers.

Non-condensable gases leaving the second condenser contain a small amount of entrained fatty-acid fog



*Life-Lines* are pre-lubricated . . . need no further lubrication. Write for "Facts on Pre-lubricated Bearings" B-4378. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.  
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# INFRARED

## PROVIDES ACCURATE AUTOMATIC

# END POINT

# ANALYSIS

for

ACETYLENE

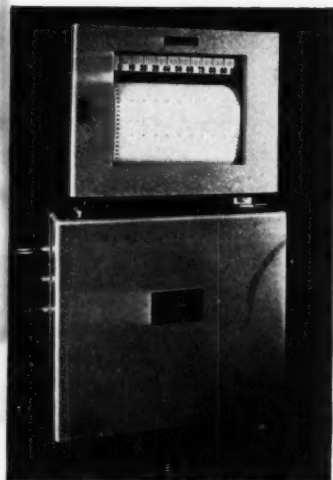
Acrylonitrile  
Acetaldehyde  
Acetic Acid  
Vinyl Chloride

ETHYLENE

Ethylene Glycol  
Ethylene Oxide  
Ethanol  
Ethylene Dichloride

with the

## PROCESS CONTROLS PLANT STREAM ANALYZER



- ▶ For these reasons, end-point analysis and its control application have become of major significance to the process engineer.
- ▶ The PROCESS CONTROLS Plant Stream Analyzer is specifically engineered for end-point analysis and control applications.

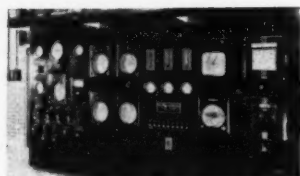
## PROCESS CONTROLS

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News, cont. . .



**AUTOMATIC CONTROLS** keep all critical process variables in line.

which would foul up the four-stage ejector system if not removed. This job is done by a wet scrubber, in which the vapors are passed through a coarse spray of fatty acids.

▶ **Instrumentation** — Automatic controls keep all critical process variables in line. All-important is the distillation step. Feed temperature is easily maintained with a narrow-band proportional controller regulating the steam supply to the dryer-deaerator. Feed rate is also easy to control.

With feed rate and temperature held constant, distillation temperature is dependent upon the Dowtherm temperature. A proportioning burner with a 5 to 1 turndown ratio works very nicely for firing the Dowtherm boiler. Temperature may be regulated with a simple high-low floating controller on the smaller units or a more elaborate wide-band proportional controller with automatic reset on the larger units.

Condenser temperatures are harder to control, probably because of the low heat-transfer coefficients. Wide-band proportional controllers with automatic resets are used.

Other variables recorded or controlled are absolute pressure, several liquid levels and a number of key temperatures.

Use of proper materials of construction is important from the standpoint of avoiding metallic contamination as well as service life of the plant. Type 316 stainless is generally specified, with the extra-low-carbon grade preferred. For distilling tall oil, Inconel is necessary.

Prime outcome of all this kid-glove handling of unstable fatty acids is, of course, greater yield and higher quality of the final product. But W&S engineers claim other important advantages for this distillation plant:

- **Flexibility**—The unit can handle a variety of different feedstocks. Most continuous processes must run on a given feed for long periods of time to

be efficient. In Wurster and Sanger's still, low hold-up and good control make it easy to establish equilibrium after a feedstock change.

• **Operating Economy**—In terms of pot still requirements, the W&S unit uses 40 percent steam, 40 percent water, 3 percent fuel oil and 8 percent man-hours.

• **Compactness**—A 4,000-lb. per hr. unit takes no more space than a 500-lb. per hr. pot still.

### New Greases Last Longer In High-Temperature Motors

Using new high-temperature lubricants, electric motors can be operated continuously at 150 deg. C. and require lubrication only at intervals from 500 to 1,000 hr., according to results of five years of research by the Naval Research Laboratory and by manufacturers of electric motors, ball bearings and lubricants.

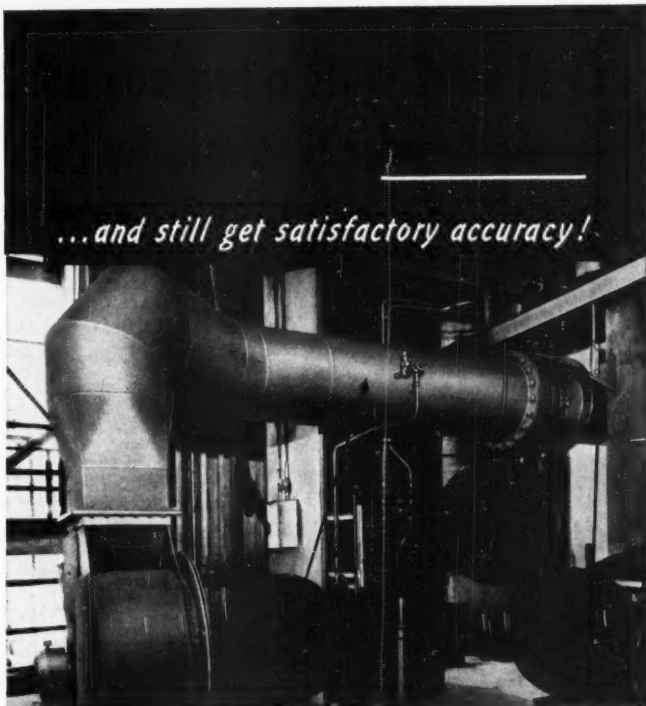
Intervals between lubrication can be even longer if the motors operate below 150 deg. C. for over half of the time. And still longer intervals will be possible when recommended changes have been made in motor design.

Development of silicone-glass insulation for electric motors and other rotating electrical equipment touched off the research. Use of this insulation in equipment was retarded by lack of information on operation of anti-friction bearings and greases at 150 deg. C. and higher.

Nine newly developed greases, all now commercially available, were investigated and tested by the Navy researchers and cooperating industries.

These included a mineral oil gelled with a strontium soap, two mineral oils gelled with sodium soaps, a mineral oil and diester blend gelled with lithium soap, a polyalkylene glycol derivative gelled with lithium soap and four silicone greases, one gelled with carbon black and the others with lithium soaps.

Only the silicone-lithium soap greases originated by NRL were useful at 150 deg. C. for over 500 to 1,000 hr. of operation without regreasing. In occasional tests with these greases good performance for as much as 6,000 hr. was observed, showing the future possibilities when the high-temperature properties of the new greases and bearings are better understood.



*...and still get satisfactory accuracy!*

The Flow Tube needs only minimum straight runs entering and following the tube, and the Flow Tube itself takes up so little space that it can be installed at practically any accessible point where flow conditions are reasonably steady. This means considerable savings in space and equipment to provide straight entering runs required by conventional head meters.

The installation shown above in a catalytic cracking unit of a Southwestern oil refinery is a typical example. Here a 30" Flow Tube with a 23.9" throat ( $D/d=1.26$ ) is measuring the air used to reactivate the catalyst. It delivers a differential of 10" of water for a maximum flow of 39,000 standard cfm at 137°F. and 3.5 psig. The unrecovered

head loss in this Tube at maximum flow is 1" of water. Two other tubes are also operating under similar conditions in this refinery.

All are performing satisfactorily as installed. Periodic checks all show that they are measuring within plus or minus 2% of the blower manufacturer's characteristic curve.

Flow Tubes are manufactured exclusively by Foster Engineering Co. in all pipe sizes for measuring the flow of liquids and wet or dry gases. Flow Tubes can be furnished with or without suitable secondary indicating, recording, or totalizing instruments. For further information, ask for Bulletin FT-101; and for specific recommendations, please send us necessary flow data.



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News, cont. . .

Lowering the operating temperature to 125 deg. C. resulted in a large increase in the life of all greases tested, the silicone-soap greases having a clear advantage over all others. However, several non-silicone greases gave dependable operation at 125 deg. C. for 1,000 to 2,000 hr. without regreasing.

For operation at 100 deg. C., the three soap-gelled silicone greases and three of the non-silicone greases gave 10,000 to 15,000 hr. of satisfactory operation without relubrication.

Another outcome of the research was suggested changes in motor design to make the best use of the new greases. For maximum utilization of Class H insulation in electric motors, the lubricant system should be redesigned so that more of the fluid bled from the grease will migrate into the bearing.

Seals or shields to prevent loss of grease from the bearing, a larger reserve of grease within the bearing itself, ball cages of selected non-ferrous metals and the use of bearing steels stable at higher temperatures are all factors to consider in future motor designs.

**Biggest Block of Power Ever  
Will Go to New Atomic Plant**

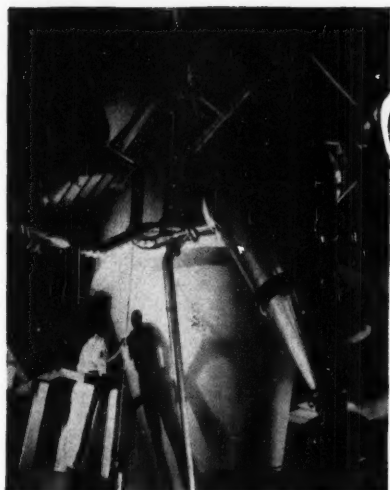
A group of 15 power companies have organized the Ohio Valley Electric Corp. to furnish electricity to the new atomic plant near Portsmouth, Ohio.

Ohio Valley Electric will be incorporated in Ohio, and a subsidiary, Indiana-Kentucky Electric Corp., in Indiana. Both were organized specifically to contract with the Atomic Energy Commission to supply power to the new atomic plant.

Philip Sporn, president of American Gas & Electric Co., heads the group of 15 electric companies.

Greatest single block of power in the industry's history will be required. It will take two generating systems with a total capacity of 2.2 million kw. to provide electricity for the gaseous diffusion plant. It will produce uranium-235.

Providing this power will cost about \$400 million. Plants are still in the blueprint stage, and sites for the stations have not yet been selected. These and other details will be decided when the 15 companies have a firm agreement with AEC.



Here's the way The Upjohn Company, Kalamazoo, Michigan uses Swenson Spray Dryers to manufacture a preparation of proteins and carbohydrates reinforced with vitamins.

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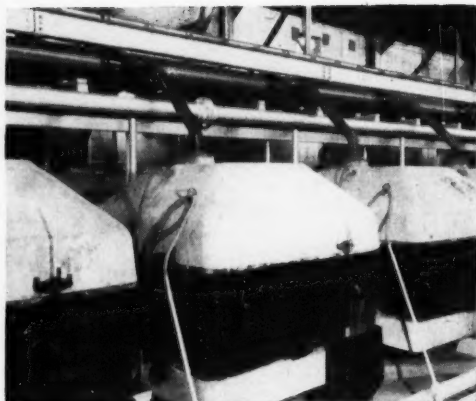
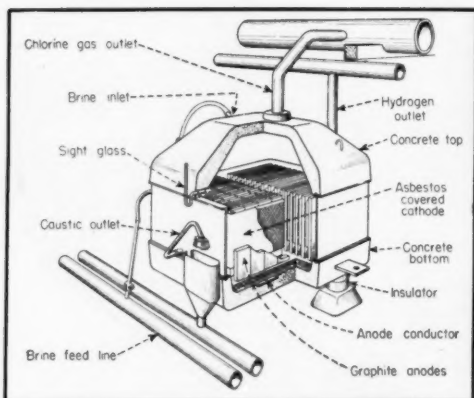
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## Trend to Bigger Cells

**With the larger S-3 and the new S-3A, Hooker deposited-diaphragm cells are maintaining a leading position in the chlorine-caustic industry.**

Despite recent publicity extolling the virtues of mercury-type cells, the diaphragm cell is still king of the chlorine-caustic industry. And among diaphragm cells, the popular choice seems to be the Hooker S-3 and its recently developed counterpart, the S-3A, illustrated above.

These two cells already account for 950 tons per day of chlorine capacity installed in six plants and, as shown in Table I, will account for 1,300 tons per day by the end of next year. Combined with the older Type S cell and such modifications as the Columbia version, the installed capacity of Hooker diaphragm cells will amount to 4,800 tons per day of chlorine in 1953, representing about 45 percent of the estimated U. S. total.

► **For Larger Plants**—Although Type S is still preferred for smaller plants, the S-3 and S-3A have completely superseded the older cells for large new installations; per ton of capacity, they are cheaper to install and operate and take up less building space.

The new S-3A cell is essentially the S-3 rotated 90 degrees, explain Hooker's project engineer Deane Hubbard and research supervisor Morton Kircher. It has heavier copper connections, however, to provide for operation at overloads up to 30,000 amp.

When the S-3 was designed to pro-

vide a two- to threefold capacity advantage over the older Type S, its dimensions were based on the customary cell-room width of 45 ft. per double row of cells, including the aisle space between. The necessary increase in lateral cell dimensions was made in the direction of the row of cells, rather than towards the aisle, so that the required servicing room would not be reduced.

But many of the cell rooms had aisles wider than 45 ft. and, of course, there was no set width limit for new cell rooms. So the S-3 was redesigned to take up more width and less length; this required relocating the various leads and connections.

► **More Cells per Line**—The S-3A, therefore, takes up less room in the direction of the cell row, permitting the installation of more cells per unit of cell-room length.

Floor space required per cell for the two types is approximately the same. However, since the S-3A is rated at

24,000 amp. as compared with 20,000 for the S-3, output per unit of floor space is 20 percent more with the S-3A when both are run at rated capacity.

The Type S cell was originally designed (back in 1929-30) to operate at 6,000 amp., but under today's conditions it pays to run it at higher ratings, up to 10,000 amp. or more. Power efficiency suffers somewhat at the higher ratings, but investment per unit of production is less.\*

As the chlorine industry expanded during and after the war, the need for a cell with still higher output and lower operating costs became acute. Hooker responded with the S-3. At a nominal rating of 20,000 amp., the S-3 produces better than 15 lb. of chlorine per sq. ft. of floor space, including aisles, whereas the Type S, even at 10,000 amp., can turn out only 9.2 lb.

The economic significance of the S-3 development may be illustrated for two different installations.

Where it is desired to construct on an entirely new site a 200-ton-per-day chlorine plant, the lower investment

(Continued)

\* See Hubbard's study on cell operating economics, *Chem. Eng. Prog.*, Sept. 1950, pp. 435-439.

Table I—How the U. S. Will Make Chlorine in 1953

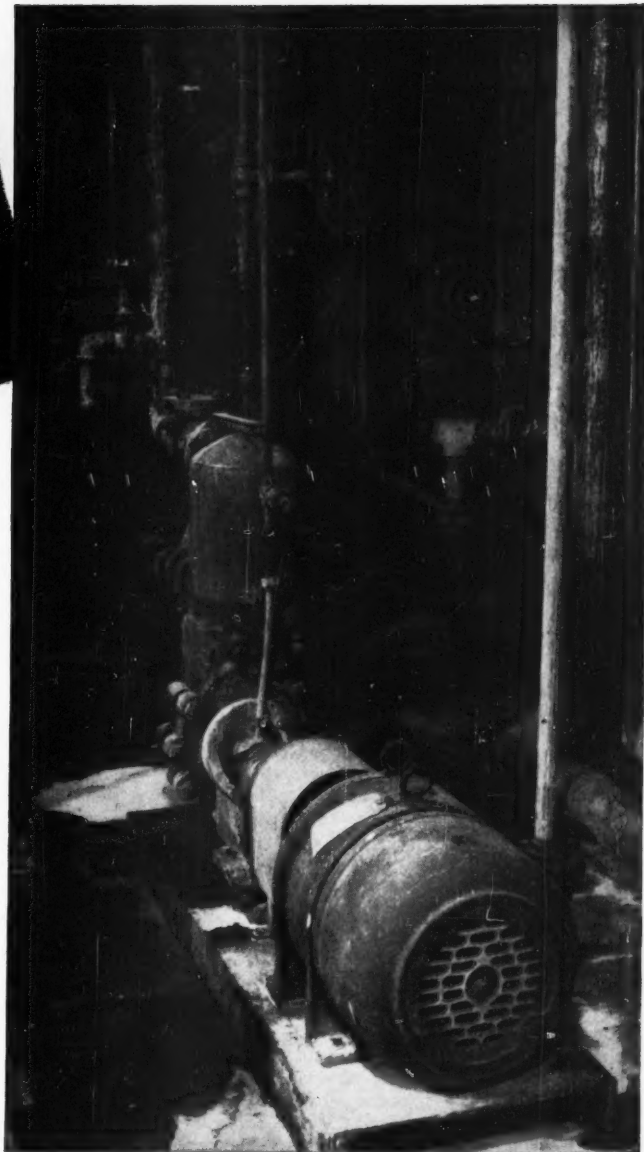
	Tons per Day	Percent of Total
Diaphragm cells, total	8,400	78.6
Hooker Type S and Hooker-Columbia	3,500	32.8
Hooker Type S-3 and S-3A	1,300	12.2
Dow filter-press cell	2,700	25.3
Other diaphragm cells, including Diamond, Gibbs, Vorec, Allen-Moore, etc.	900	8.4
Mercury cathode cells, including Castner, Mathieson, de Nora, Dow, Solvay, I.C.I., Wyandotte	1,550	14.5
Fused-salt cells	600	5.7
Chemical processes, such as nitrosyl chloride and HCl	135	1.2
Total	10,685	100.0

## STARVATION DIET

This LaBour self-priming centrifugal pump in a midwestern chemical plant handles filtrates containing sulphuric and lactic acids. Operating conditions impose particular difficulties which demand the special ability of the LaBour.

There is no steady supply of liquid. The intake is frequently pumped dry, starving the system. Still, the LaBour Type DPL pump is on the job continuously, priming itself and picking up pressure the instant liquid is again at hand. It repeats this cycle with simple, trouble-free dependability as often as necessary.

Wherever you find the "impossible" jobs being done dependably and efficiently, you are likely to find a LaBour pump. Write for information today.

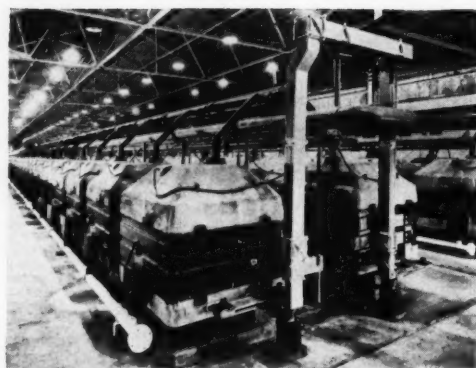
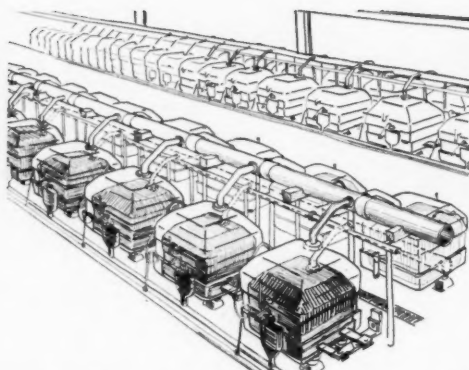


ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

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REPLACEMENT of Type S with S-3A is illustrated at left; S cells are shaded, S-3A are superimposed.

and operating costs of S-3 or S-3A cells, as compared with the Type S, are estimated as an increase in return on investment in cells, cell equipment and building of about 6 to 7 percent.

Or, where a plant is located in the center of an industrial area and an expansion of 200 tons per day of chlorine is desired, conversion of an existing cell building to use of the larger cells may eliminate the need for putting up a new plant at a considerable distance from the existing plant. Savings both in investment and operating costs might amount to 15 percent or more difference in the return on investment. Other comparative performance data are shown in Table II.

► **Deposited Diaphragm**—Development of the deposited asbestos diaphragm in 1925-29 made possible the design of the Type S cell and has contributed largely to its high efficiency.

The diaphragm is remarkably easy to apply. The steel screen cathode is dipped into a bath of asbestos slurry. The asbestos is drawn onto the screen by applying a vacuum to the hydrogen outlet, much like the preparation of an asbestos filter in the chemistry lab.

Hooker put in its first full circuit of Type S cells at Niagara Falls in 1934. In addition to using them in its own

operations, Hooker licenses its cell design to chlorine producers all over the world, with individual plant capacities ranging from 5 to 600 tons per day.

Fabrication of the cells themselves has been streamlined to a virtual assembly-line basis. In an early issue, *Chemical Engineering* will present a picture story of how Hooker cells are made.

Table II—How Hooker Cells Perform

	Type S	Types S-3 and S-3A	
	10,000	15,000	20,000
Current, amp.	3.75	3.4	3.65
Volts	94	91	95
Temperature of effluent, deg. C.	11.3	11.1	11.65
NaOH in effluent, percent	1.0	1.0	1.0
NaClO <sub>2</sub> per 1,000 parts NaOH	96.0	95.5	96.0
Current efficiency, percent	2.690	2.440	2.610
Power consumption, kwh. per ton chlorine	360	425	360
Average anode life, days	6.7	7.8	6.9
Lb. graphite per ton chlorine	120	140	120
Average diaphragm life, days	0.333	0.500	0.667
Chlorine per cell per day, tons	0.367	0.564	0.750
NaOH per cell per day, tons	9.0	11.8	15.7
Chlorine per sq. ft. of floor space, lb.			18.9

<sup>1</sup> When supplied with heated brine (65-70 deg. C.).

<sup>2</sup> Can be controlled to maintain any concentration within range of approximately 10.0-13.0 percent with corresponding changes in other performance data.

<sup>3</sup> Including all aisles but not including cell renewal space.

## Titanium Metals Leases Added Facilities at Henderson

Expanding production of titanium at Henderson, Nev., Titanium Metals of America has leased additional holdings at the Basic Magnesium plant near Hoover Dam.

Titanium Metals, jointly owned by National Lead Co. and Allegheny Ludlum Steel Corp., has been granted approval by the Colorado River Commission for Nevada on a lease transfer for Unit 10 of the BMI. The facilities were previously leased by Pioche Manganese, Inc.

The big unit will be converted immediately to the production of titanium, the lightweight metal used in atomic weapons and jet aircraft.

Titanium Metals of America is one of the five major industrial firms located at Basic Magnesium. Its operations are cloaked by government security.

## Tank Barge to Carry Sulphur From Mines to Acid Plant

Molten sulphur will be carried from the Moss Bluff, Tex., mines of Texas Gulf Sulphur Co. to the Houston sulphuric acid plant of Consolidated Chemical Industries in a huge tank barge with a capacity of 1,000 tons. Leland D. Smith, traffic manager for Consolidated, says that 90 percent of the sulphur used by the company will be moved by the new carrier.

Recently launched at Beaumont, Tex., the barge was built by Bethlehem Steel Corp. for Coyle Lines, Inc., which will operate it. Consolidated Chemical has a five-year contract with Coyle Lines.

The 167-ft. insulated tank is in a barge 200 ft. long. Fiberglass insulation helps to maintain a temperature of 300 deg. F. within the tank. Cost of the tank barge: an estimated \$160,000.

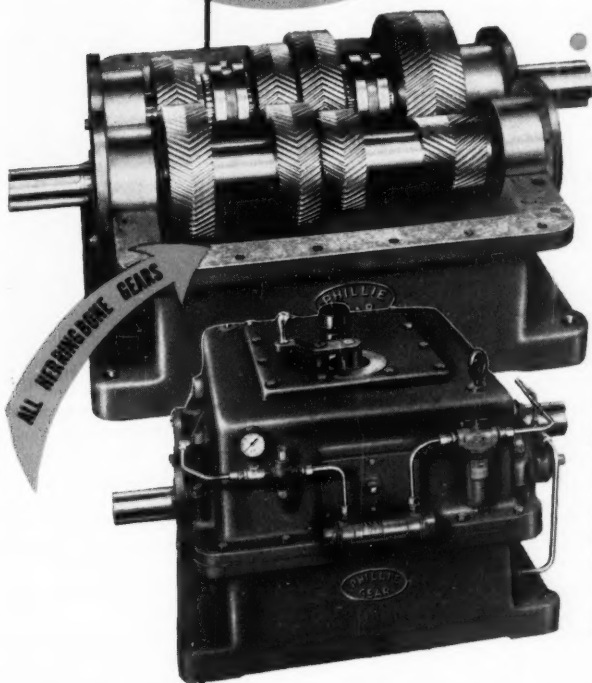
Consolidated has spent about \$250,000 for storage tanks and pipeline equipment for the project. The quick turn-around of 40-hr. barge service and the molten state of the sulphur will mean efficient and dependable delivery of sulphur at Consolidated's acid plant in Houston.



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## **a Change-Speed Unit**

- 2, 3 or 4 Speed Combinations
- Wide Range of Ratios
- For Speed Reduction, Speed Increasing, or a combination of both



Industry has long needed a standardized Change Speed Unit, designed and built to eliminate the high cost and delayed delivery of specially built units.

Philadelphia Gear is now able to offer a line of these units, backed by 20 years of knowledge and experience in the building of Change Speed Units constructed to individual specifications . . . Hundreds of these Units are today in successful operation.

These new Philadelphia Standardized Units are positive, reliable Geared Drives, using Herringbone Gears throughout,—and they provide definite ratios of Speed Reduction, Speed Increasing, or a combination of both. There are no belts to wear out and cause speed variations. They are available for a wide range of horsepower, and in 2, 3 or 4 Speed Units (photos show a 4 Speed Unit).

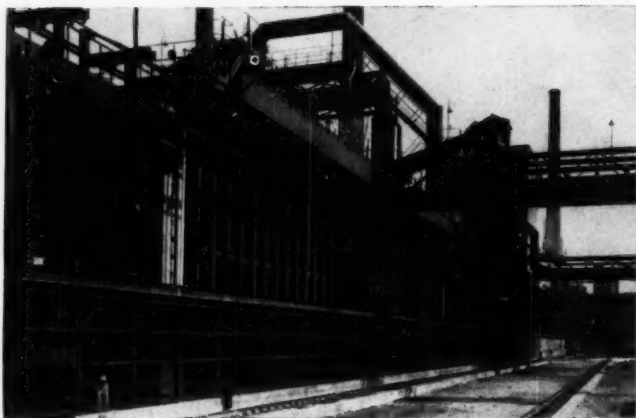
A new Catalog CSU-52 illustrates and describes these Units in detail. Send for a copy.

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COKE OVENS—nucleus of Neville Island's varied but closely knit activities.

## Accentuate the Chemical

**Pittsburgh Coke & Chemical adds units for plasticizers, insecticides and fine chemicals to its fast-growing portfolio of production facilities.**

Thirty-five new coke ovens came into full operation early in October, marking completion of the first step in Pittsburgh Coke & Chemical Co.'s \$20-million expansion program at its Neville Island plant.

The new battery of ovens is one of eight units involved in the expansion program, scheduled for completion early in 1953. Others are a new blast furnace, four new chemical plants, and additions to the cement plant and boiler plant.

► **Chemicals Go National**—The company's production of coke, pig iron and cement goes chiefly to regional markets. Output of the new chemical facilities, however, will find its way into varied national markets.

Here's the lineup on plants under construction:

- A commercial unit for making plasticizers, expected to be in production any day now, will replace a smaller plant built in 1950.

- New units for turning out 2,4-D and 2,4,5-T will expand activities of the company in the field of agricultural chemicals.

- A new fine chemicals plant will produce dyes and intermediates.

- A second unit for making activated carbon—directly from coal—is on the program.

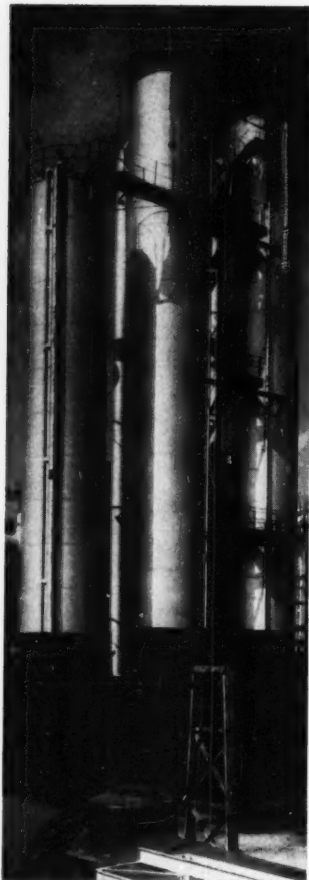
Revenue from chemical sales amounted to 37 percent of the company's \$50 million total during 1951; this proportion has been increasing fast. From 1947 to 1951, chemical sales rose some 390 percent, as against a gain of 125 percent in sales of other products.

Some \$3.3 million of the present expansion budget is going into chemical facilities; this is on top of more than \$7 million spent in the past four years for new chemical plants. Total capital spending since the war for expansion and improvements comes to \$34 million.

► **Island Empire**—Starting with a blast furnace originally built in 1900 by Carnegie Steel, Pittsburgh Coke & Chemical developed its Neville Island works into a well integrated structure which formed the base for entry into the chemicals field.

First steps toward chemical production came in 1929 with the construction of an ammonium sulphate plant and a light oil distillation plant for recovery of benzene, toluene and xylene. These two units were enlarged in 1950.

Next step was tar refining. To achieve this the company put in during 1939 a Wilton continuous tar still, followed by a tar acid plant for pro-



DISTILLATION unit has been revamped to get bigger output of chemicals.

duction of phenol and cresols and a naphthalene plant.

Following in rapid succession have been: A tar base distillation plant for getting pyridine and picoline from light oils; a sulphuric acid plant; facilities for recovering HCN and  $H_2S$  from coke oven gas; an activated carbon plant; a general chemical pilot plant; other units for making protective coatings, 2,4-D, phthalic anhydride, agricultural chemical formulations, benzene hexachloride, plasticizers and organic phosphate insecticides.

► **Basic Operations**—The original blast furnace was substantially rebuilt and enlarged in 1942, partially relined in 1946 and fully relined in 1950.\* A

\* The company also operates a blast furnace at Struthers, Ohio.

plant built in 1949 for briquetting flue dust and ore fines gets more efficient use of the furnace charge.

Of the 140 coke ovens, 70 were built in 1929, 35 in 1950, and the last 35 have just gone in. All of them are of the Koppers-Becker type, with the last 70 having under-jet combination ovens.

As constructed in 1929, the cement plant had two rotary kilns, two wet mills and three dry mills. In 1948 the company put in an additional kiln for drying waste slag from the blast furnace for use in making Pozzolan cement; an additional dry mill was installed in 1949.

► **First or Only**—Pittsburgh Coke & Chemical boasts a number of "first's" and "only's" such as: First Wilton continuous tar still in the U.S.; only major producer of activated carbon from coal; only major byproduct oven source of foundry coke in the Pittsburgh area; only major merchant producer of pig iron in the Pittsburgh area; first system in the U.S. for isolation of pure HCN from coke oven gas.

### Monoglyceride Production Starts in New Glyco Plant

Glyco Products Co., Inc., is bringing its new Williamsport, Pa., plant into volume production. First products being turned out are edible monoglycerides.

New equipment and modern design of facilities by the H. K. Ferguson Co. will give more efficient and economical production. Enlarged storage and shipping facilities have also been installed. Control, production and development laboratories are being completed.

The new plant on a 30-acre site is served by four railroad sidings. Its power plant has three coal and oil-fired high-pressure boilers with a total capacity of 1,400 hp. A 500-kw. geared turbine and generator supply electric power.

Processing water at the rate of 500 gpm. is furnished by wells. Heavy-duty tunnel dryers occupy two floors of one building. Refrigeration is supplied by a 41-ton ammonia unit.

All civilian production will gradually be transferred to Williamsport from the Natrium, W. Va., plant. This operation should be completed by November 1. Present plans call for the Natrium plant to concentrate on production of special chemicals for the defense program.

## You can count on KEMP to solve any inert gas problem



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**D**AY AFTER DAY Kemp users throughout the chemical field report: Kemp Inert Gas Generators maintain a specific analysis of chemically clean inert gas regardless of demand . . . eliminate the possibility of mixture fluctuations in critical processing . . . offer the finest choice of flexibility in design. Fast-starting, easy-to-operate Kemp Generators also save you both time and money by reducing costly warm-up period necessary for starting other makes. You

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OF BALTIMORE

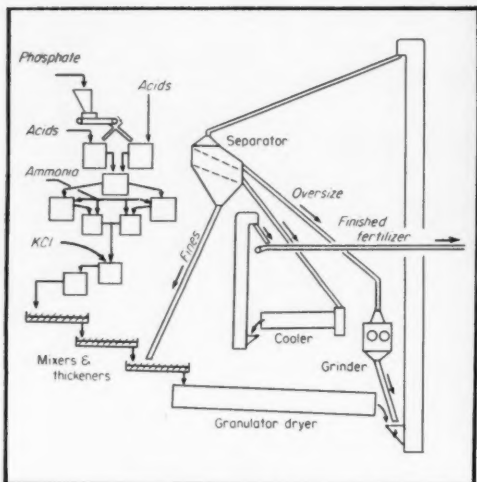
### INERT GAS GENERATORS

Write for Bulletin I-10 for technical information

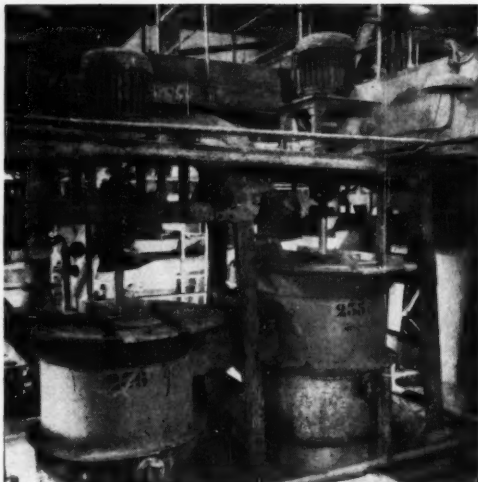
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COMMERCIAL PROCESS boasts simple equipment.



ACIDULATING AND AMMONIATING vessels are similar.

## French Prove Nitraphosphate Process

**The first U.S. fertilizer plants using nitric acid on phosphate rock are now on the drawing boards. Here's a look at a successful foreign plant using the process.**

Nitric acidulation of phosphate rock will be done in three U.S. plants now being designed. DPA has just issued certificates to Northern Chemical Industries, Sandy Point, Me., for \$1.4 million, and to Allied Chemical, South Point, Ohio, for \$6 million.

Also, Associated Cooperatives, Inc., is putting up a plant which will go into operation next year in Sheffield, Ala. It will turn out about 60,000 tons of fertilizer a year when it reaches full production.

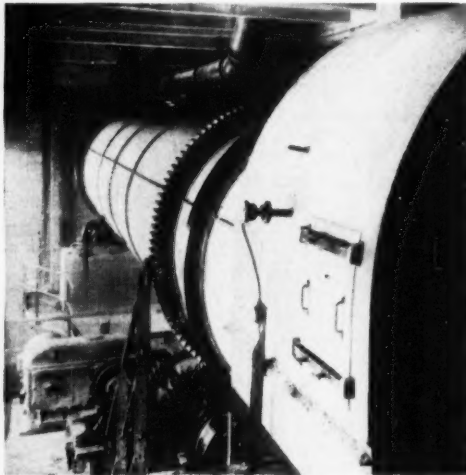
U. S. interest in nitraphosphate has

been stimulated by (1) the acute short supply of sulphuric acid for producing normal superphosphate and phosphoric acid, and (2) DPA's recent plea that phosphate fertilizer capacity be upped to 3.6 million tons by mid-1954.

►Old Hat Abroad—But for the past 11 years a plant in Rouen, France, has been successfully using nitric acid to turn out granulated phosphate fertilizers. Last year the plant, owned by

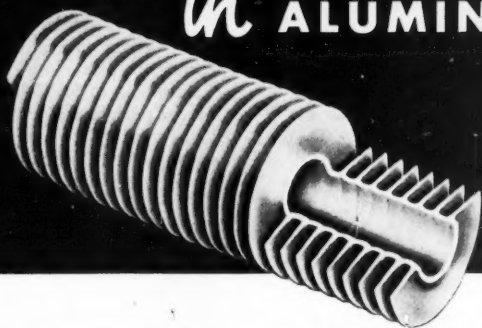


MIXERS receive slurry after addition of KCl and fines.



ROTARY DRYER AND GRANULATOR are conventional.

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in **ALUMINUM**



Efficient . . . economical . . . compact . . . light-weight—four valuable assets in any heat-transfer application. Aluminum Trufin meets all these requirements.

Because of its integral fin construction—Trufin can withstand extreme temperatures and severe vibration without affecting heat-transfer efficiency.

Actual applications have revealed that the heat-transfer efficiency of Trufin is sometimes *nine times* greater than plain tube! In many instances the use of Wolverine Trufin has resulted in low-cost installation and maintenance with maximum heat-transfer efficiency.

Aluminum Trufin is light; it's durable; and it's as easy to fabricate as plain tube!

Aluminum Trufin is available in hard or soft tempers; and in a variety of sizes—with inside diameters ranging from  $\frac{3}{16}$ " to 1".

Send for your copy of Wolverine's Bulletin dealing with Trufin and heat-transfer.

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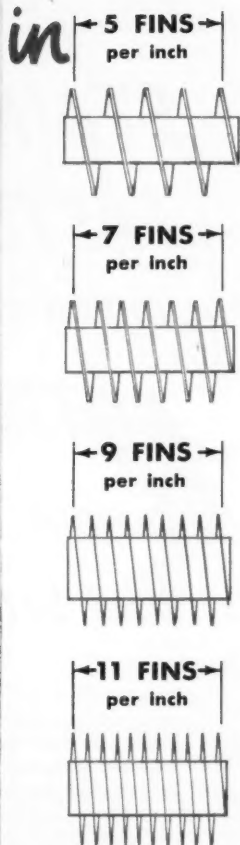
Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario.

\*REG. U. S. PAT. OFF.



**PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA**  
Sales Offices in Principal Cities

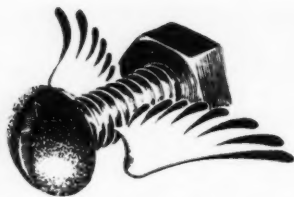
Export Department, 13 E. 40th St., New York 16, N. Y.



Wolverine manufactures Trufin condenser tubes in copper and copper base alloys and bi-metal in a variety of fin spacings and fin heights. —also plain condenser tubes in copper and copper base alloys.



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LEADERSHIP  
IN FASTENINGS OF  
STAINLESS STEEL**

News, cont. . .

St. Gobain Co., was expanded to produce 120,000 tons annually.

The company's continuous process consists of: Acidulating rock phosphate, ammoniating, adding KCl, granulating, drying, screening and grinding. The plant includes a phosphoric acid unit so acidulation can be done with nitric plus either sulphuric or phosphoric, or all three together. Eight workers on each of three shifts operate the plant.

According to St. Gobain, its process can produce a wide range of fertilizers to meet the varied requirements of agriculture. The ratio of  $P_2O_5$  (as dicalcium phosphate) to nitrogen (half nitrate, half ammonia nitrogen) can reach 1:5 in the sulpho-nitric process. Furthermore, the relative amount of soluble potash can be varied as required.

The ratio of nitrogen delivered to the consumer to the nitrogen introduced into the process as nitric acid and liquid ammonia has averaged 98 percent in commercial operation.

## **National Carbon Expanding Graphite Electrode Plant**

National Carbon Co., a division of Union Carbide & Carbon Corp., is constructing an \$8,456,000 addition to its Columbia, Tenn., plant. When completed in about a year the added facilities will increase National Carbon's capacity for producing graphite electrodes by about one-third. The electrodes are used in electric furnaces.

National Carbon has been granted a fast tax writeoff on 65 percent of the construction cost. The new facilities will add about 75 to 100 employees to the payroll, bringing total employment at the Columbia plant to more than 700.

## **Pittsburgh Plate Making Superfine Glass Fiber**

Production of superfine fiber glass has been started by Pittsburgh Plate Glass Co. at its new Shelbyville, Ind., plant. It is less than six months since Pittsburgh Plate acquired the plant.

Output will be stepped up at the Shelbyville plant until four tanks are producing superfine fibers and 50 bushings are turning out continuous fiber. The plant should be operating at capacity early next year.

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*Controlled high quality helps produce larger profits with  
versatile, dependable Esso Solvents.*



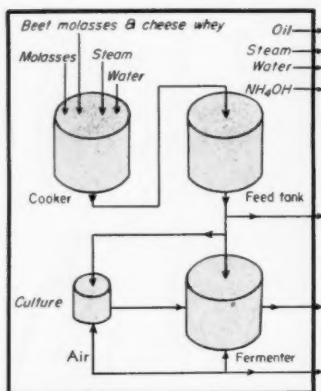
## PETROLEUM SOLVENTS

SOLD IN Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

**ESSO STANDARD OIL COMPANY** — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, West Va. — Charlotte, N. C. — Columbia, S. C. — Memphis, Tenn. — New Orleans, La.

### FOR TECHNICAL ASSISTANCE

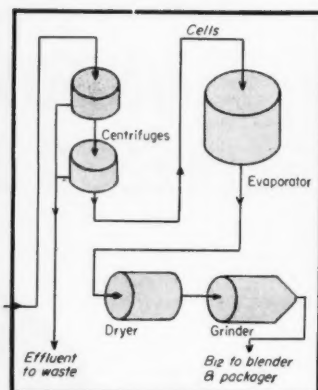
If you have a solvents problem or want further information on the specifications and characteristics of Esso Solvents—write or call our office nearest you. Our technicians will be glad to assist you.



PREPARATION



FERMENTATION



SEPARATION

## Yeast Producer Thrives on B<sub>12</sub>

**Process has two bonus features: it's semi-continuous, doesn't require sterile conditions. Here's how cost-conscious engineering makes the most of a marginal market.**

Despite a late start, Pacific Yeast Co. (Wasco, Calif.) has assumed a leading position among the top producers of cobalamin (vitamin B<sub>12</sub> complex). In the past 18 months, plant capacity has been increased over 200 percent.

This achievement is all the more remarkable in view of the general decline in the B<sub>12</sub> market. But there's a good explanation: Pacific Yeast has worked out a semi-continuous version of a basic fermentation process developed by the Western Regional Research Laboratory of the U. S. Department of Agriculture. Costs have been cut enough to guarantee economic success even when the market is in the doldrums.

► **Soft Market**—When WRRL started work on the production of B<sub>12</sub> from *Bacillus Megatherium*, the market for B<sub>12</sub> supplement in livestock and poultry feeds seemed unlimited. Everybody was getting into the act. The result was that too many producers jumped on the bandwagon, and, with the poultry market in a temporarily depressed state, there is simply too much B<sub>12</sub> on the market. Increasing competition from antibiotics has also contributed to the B<sub>12</sub> decline.

Several marginal producers have already been squeezed out. It's been reported that Merck has changed a

new plant designed for B<sub>12</sub> into a production unit for another product; Lederle is said to have done the same thing.

But, with the continuing help of WRRL, Pacific Yeast has been able to swim against the tide.

► **Better Process Does It**—Working with WRRL, Pacific Yeast improved the process in two important ways: through development of "continuous propagation" and of bacteriophage-resistant strains of the fermenting organism. With continuous propagation the process has been made continuous in the sense that fermentation doesn't stop—as the products of fermentation are removed, fresh nutrients are added to keep the reaction going. Bacteriophage-resistant strains have cut costs by increasing yields and eliminating the need for sterile fermenting conditions.

Development of these process improvements took about six months, so Pacific Yeast didn't get into full production until late in 1950. (WRRL's basic process was developed early that year.)

► **How B<sub>12</sub> Is Turned Out**—Pacific Yeast's process uses *Bacillus Megatherium* as does the basic Western Regional process. The government patent says that, in essence, the medium for culturing the *Bacillus Megatherium*

organism must contain, besides water, (1) a nutrient source; (2) a source of nitrogen; and (3) suitable minerals such as zinc, iron, manganese, magnesium, calcium and cobalt in trace amounts (1 to 100 ppm of each). Of these elements, cobalt is absolutely essential since it is a constituent of the vitamin.

Raw materials at Pacific Yeast are beet-molasses and cheese whey (from cottage cheese manufacturing plants) in various proportions, depending on the current cost of each. Experience has shown, though, that a mixture is better than all of one or the other. This flexibility in the choice of raw materials is of prime importance in keeping process costs down in marginal times.

The mash is sterilized by steam injection, and ammonium hydroxide is added in amounts depending on nitrogen requirements. The pH is adjusted (adding ammonium hydroxide or weak organic acid—phosphoric, citric, etc.) to a point somewhere between 6.5 and 7.0 and held to within plus or minus 0.05.

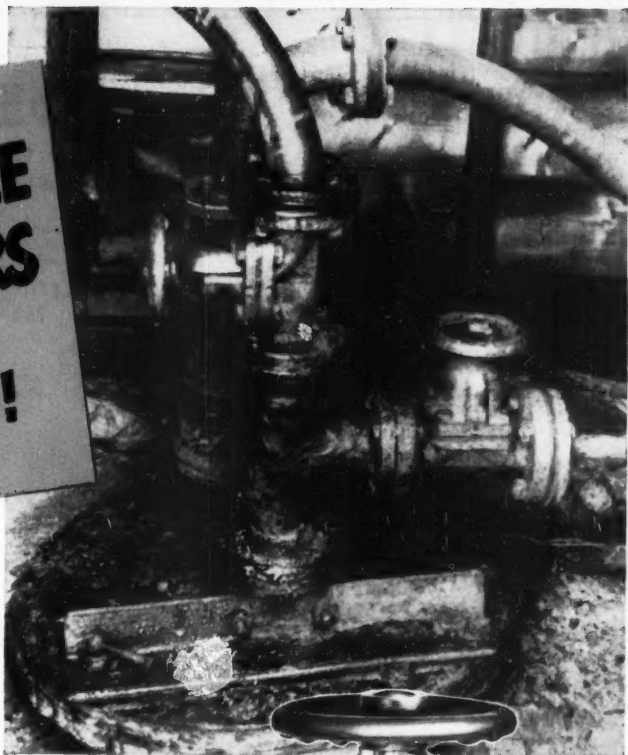
The fermenter is seeded with *b. megatherium* after the mash has been cooled to 95 deg. F. Higher temperatures increase cell growth rates but decrease B<sub>12</sub> yields; lower temperatures decrease growth rates.

Aeration and agitation help speed up the process. Residual sugar content and cell volume are watched closely. As the sugar content approaches zero, *b. megatherium* cells are harvested from the broth by means of high-speed centrifuges, and fresh nutrient is added at rates that keep the sugar content

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Another  
'open and closed'  
case for



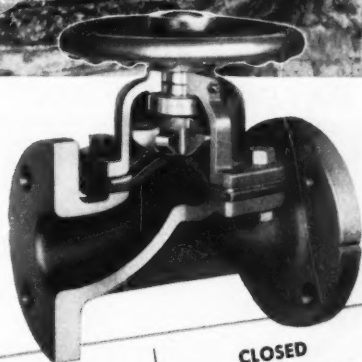
## GRINNELL-SAUNDERS DIAPHRAGM VALVES

In 1936, a Canadian mine installed Saunders Diaphragm Valves with rubber linings on the feed and drain piping of an underground tank used for the storage of muriatic acid. Today, after 15 years, those *same* valves are in use—having required no maintenance except for periodic replacement of diaphragms, a simple operation done without removing the valve from the line.

Grinnell-Saunders Diaphragm Valves are available in many different combinations. Bodies are made in a variety of metals—iron, stainless steel, bronze, aluminum and others. *But of more importance* is the fact that a body of cast iron (a metal not in short supply) can be lined with glass, lead, natural rubber, neoprene and other materials which, in many instances, handle corrosive fluids *better* than metals.

Diaphragms come in natural rubber, neoprene, butyl, hycar, a special synthetic for foods and KEL-F. This last is chemically inert to all acids and alkalis in all concentrations with the exception of molten alkali metals.

From this broad selection of materials, the problems which the Grinnell-Saunders valve can solve are extremely varied. No wonder industry after industry is putting it on the line.



### OPEN



No packing glands to demand attention. Working parts isolated from fluid...sticking, dogging, contamination, corrosion eliminated.

### CLOSED



Compressor or finger plate supports the diaphragm in all positions. No metal-to-metal seats to become damaged or wire-drawn.

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## NICHOLSON TRAPS

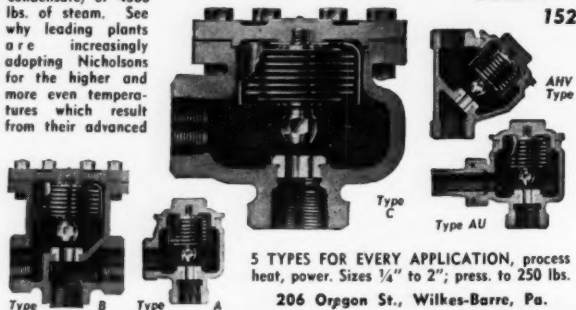
# SAVE 4580 LBS. OF STEAM Per CYCLE

A large user of steam on the west coast reports that substitution of Nicholson traps for a mechanical type effected a cyclic saving per dryer of 550 gallons of condensate, or 4580 lbs. of steam. See why leading plants are increasingly adopting Nicholson for the higher and more even temperatures which result from their advanced

features: operate on lowest temperature differential; 2 to 6 times average drainage capacity; maximum air venting. Send for . . . . .

**BULLETIN**

**152**



5 TYPES FOR EVERY APPLICATION, process heat, power. Sizes  $\frac{1}{4}$ " to 2"; press. to 250 lbs. 206 Oregon St., Wilkes-Barre, Pa.

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News, cont. . .

and cell volume at proper levels for maximum  $B_{12}$  production. The process can run 48 hours without re-seeding. **► Gives Stable Product**—The cells, obtained when the culture is withdrawn and sent through centrifugal separators, are in the form of a cream of about 15 percent solids. This slurry is further concentrated by evaporation to 25 percent solids and drum-dried; the dried material is then pulverized, screened and bagged. The final product is free flowing, light brown in color and relatively stable—losing less than  $\frac{1}{4}$  of its potency per year.

Production improvements have given higher yields than the patent application would indicate possible. Pacific Yeast would give no indication of its production rate but said that it "does considerably better than WRRRL's yield of 50 g. of b. megatherium per 100 g. of sucrose and 15 mg. of  $B_{12}$  per kilogram of b. megatherium cells." Pacific Yeast's process uses 20,000 gal. fermenters which are charged with 4,000 lb. of sugar equivalent (to give a 5 percent sugar concentration) and about 700 lb. of 20 percent nitrogen in the form of ammonia (140 lb. of 100 percent nitrogen). One 20,000 gallon tank can produce one ton of dried bacterial cells per hour, the tank contents are turned over about every 4 hr. The same process in a batch-wise operation would take about 10 hr.

Working with the process, Pacific Yeast found sterile conditions to be unnecessary because spores cannot multiply quickly enough in 4-6 hours.

**► Two Big Boosts**—Advantages of the process are its continuous nature and the fact that the system does not have to be sterile. Because it can be made continuous, there is a higher yield per unit fermentation volume; because it does not have to be operated under sterile conditions,  $B_{12}$  can be produced on present yeast specialties equipment.

With its improved process, Pacific Yeast has proved once again that sound, cost-cutting engineering can do much for the over-all economic success of a process.

## Pressure Cooker Makes Dyeing Synthetics Easier

What is, in effect, a "pressure cooker" for dyeing cloth made from the newer synthetic fibers has been developed by Du Pont. It marks the



first major change in batch dyeing methods for fabrics in 500 years.

Previously these man-made fibers have been much harder to dye than natural fibers like wool and cotton. The new pressure dyeing machine makes it easier to dye fabrics made from the new synthetic fibers, particularly acrylics such as Orlon and polyesters such as Dacron. The machine dyes the unfinished cloth and not the yarn. It handles fabric batches as small as 100 yd. in length and batches in excess of 1,000 yd.

The pressure dyeing machine is still undergoing development at Du Pont's Newport, Del., textile laboratory. Paul M. Cole, senior research engineer, who designed the machine, admits that a few bugs still have to be worked out with the cooperation of textile machinery manufacturers and practical dyers. However, he proudly points out that the machine potentially meets every requirement of an "ideal dyeing machine."

Called a Barotor, the machine gets its name from its principal mechanical parts—a rotor and uniquely operating bars within a steel cylinder. During operation, temperature inside the cylinder is normally 250 deg. F., corresponding to a pressure of 15 psi. Thus the dye is "pressure cooked" into the fibers as the fabric is drawn through the cylinder.

Du Pont will license textile manufacturers to make the machines, and dyers will be free to use it without paying royalties.

### Automatic Aerosol Loading Plant Opens on West Coast

A custom loading plant equipped to handle over 8 million cans per year of aerosol products has been established in Los Angeles, Calif., by Par Industries, Inc.

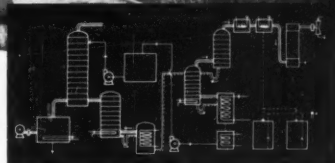
"There has long been a need for high-speed, automatic packaging of aerosol products on the West Coast," according to Edward L. Mosier, who heads Par Industries. "Eastern manufacturers," he says, "by using our facilities will be able to expedite their distribution service in this market without maintaining excessive inventories. They also can save on freight costs, since materials can be shipped in bulk, if at all, rather than in finished packages."

Par Industries maintains complete laboratory facilities, directed by experienced aerosol chemists. This

"We're giving **TANTALUM** the job!..."

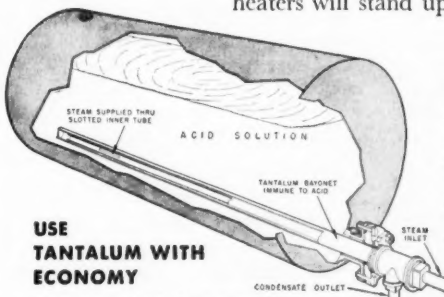


a \$3,000,000 process depends on a \$450 heater!



## Acid-Proof TANTALUM Bayonet Heaters

"If this one little heater goes out, we would have to shut down \$3,000,000 worth of associated equipment. We can't take that chance. We know that tantalum heaters will stand up. Put them in!"



USE  
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for most acid solutions, corrosive gases or vapors; not with HF, alkalis or substances containing free SO<sub>3</sub>.

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Acid-Proof

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**Cooling?**

**Air  
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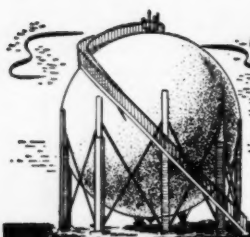
**Process?**

**Here's How to  
Get the RIGHT Answer to your  
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The right ratio of surfaces—the right materials—the right velocities—the right proportion between coil area and depth . . . there are dozens of factors that affect the efficiency, maintenance and service life of heat-exchange coils.

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NEWS, cont. . .

means a complete custom loading service for industry: valves, Freon and formulation as required, as well as cans when necessary. Mosier claims equipment in the Los Angeles loading plant includes the "highest-speed machines available."

### **Stockholders Approve Merger Of Squibb Into Mathieson**

Shareholders of both corporations have approved the merger of E. R. Squibb & Sons into Mathieson Chemical Corp. At a special meeting, 83.4 percent of the outstanding 3,142,754 shares of Mathieson common stock, owned by nearly 19,000 stockholders, was voted for the merger, with less than six-tenths of 1 percent voted against the proposal. At Squibb's meeting, stockholders representing 87.7 percent of the stock eligible to vote were for the merger, and only one-half of 1 percent voted against it.

This response of stockholders is the greatest since Mathieson started its broad expansion in 1948, when

### **CONVENTION CALENDAR**

National Fertilizer Association, annual meeting, Roney Plaza Hotel, Miami Beach, November 19-21.

American Society for Quality Control, 7th Midwest conference, Claypool Hotel, Indianapolis, November 20-21.

Federation of Paint & Varnish Production Clubs, annual meeting, Palmer House, Chicago, November 20-22.

Manufacturing Chemists' Association, semi-annual meeting and winter conference, Statler Hotel, New York, November 25.

20th National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York, December 1-6.

Chemical Specialties Manufacturers Association, annual meeting, New Yorker Hotel, New York, December 7-9.

American Institute of Chemical Engineers, annual meeting, Cleveland and Carter Hotels, Cleveland, December 7-10.

American Pharmaceutical Manufacturers Association, midyear meeting, Waldorf-Astoria Hotel, New York, December 8-10.

Salesmen's Association of the American Chemical Industry, Christmas party, Waldorf-Astoria Hotel, New York, December 10.

Society of Cosmetic Chemists, semi-annual meeting, Biltmore Hotel, New York, December 11.

*from theory  
to practice*

Laboratory research men working with ozone are already convinced that the next decade will bring forth even broader applications for ozone as yet undreamed of by practical production men.  
Tonnage Ozone in Chemical Processing, Chemical Industries, September, 1950

## Ozone Gets a Big Chemical Job

Emery develops a brand new process that'll up output of azelaic and pelargonic acids, lower costs, improve quality. It'll be ozone's biggest job yet.  
Chemical Engineering, September, 1952

That's one example where the gap between theory and practice was cut... to two short years in this case instead of the decade which research expected.

And that's only one example. In widely divergent applications, this outstanding oxidant has made difficult oxidations easy... and it has lowered costs and increased profits. Welsbach Ozone has proved itself to be versatile and valuable... generated at the point of use—with no full time supervision or labor necessary, with operating costs constant and predictable and maintenance costs negligible.

There are other reasons why it has become the oxidant of choice: No procurement problems, no material's handling, no storage expense... and no production delays, because it is generated right where you use it! Wherever there is a difficult oxidation, you'll find an application where Welsbach Ozone can be used... effectively, efficiently and at a lower cost. In chemical processes, in water purification, in industrial wastes treatment... Welsbach Ozone has made a place as industry's first choice in oxidants.

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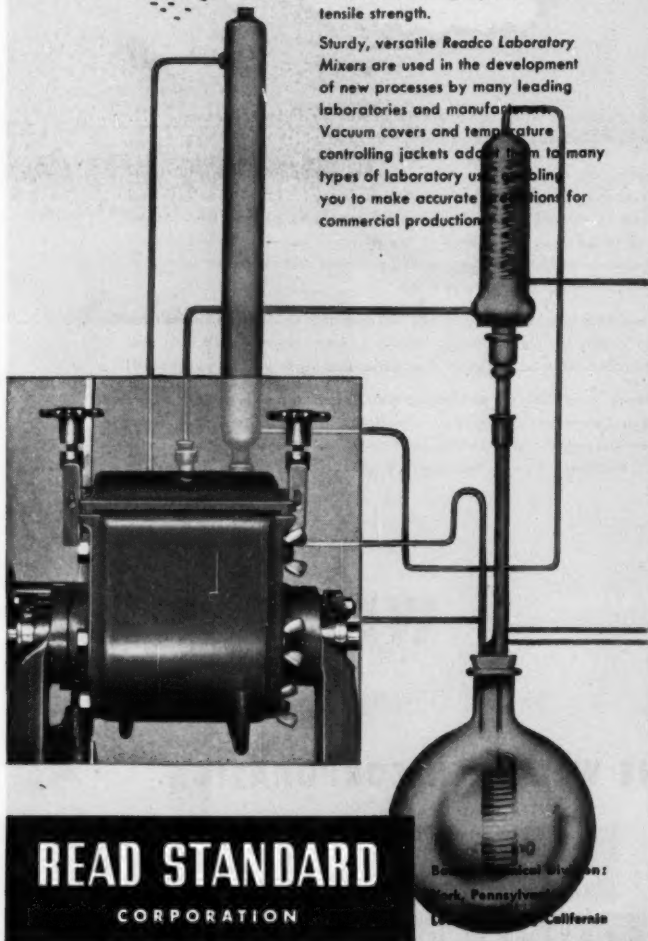
## Readco Laboratory Mixer

**speeds resin extraction  
from uncultivated rubbers**

A rapid, efficient means of extracting resins from uncultivated rubbers has been developed by the National Bureau of Standards utilizing a Readco Laboratory Mixer.

National Bureau of Standards tests prove that mastication of rubber samples in the mixer during extraction greatly speeds production of vulcanizates having superior tensile strength.

Sturdy, versatile Readco Laboratory Mixers are used in the development of new processes by many leading laboratories and manufacturers. Vacuum covers and temperature controlling jackets add them to many types of laboratory use, enabling you to make accurate reactions for commercial production.



**READ STANDARD**  
CORPORATION

Readco Chemical Division  
Pittsburgh, Pennsylvania  
Los Angeles, California

News, cont. . .

Thomas S. Nichols became president. During this period Mathieson's assets increased from \$65 million to nearly \$275 million at present, and its sales mushroomed from \$24,600,000 to nearly \$250 million, which is the rate at which sales are expected to run following this merger.

E. R. Squibb & Sons will operate as a separate division of Mathieson. Mathieson, the surviving corporation, will have an authorized capital of 250,000 shares of preferred stock and 7 million shares of common. Each share of Squibb common stock will receive three-fifths of a share of Mathieson common. Outstanding common stock of Mathieson after the exchange will amount to 5,439,930 shares. Squibb's two preferred stock issues will be replaced by two issues of subordinate debentures of Mathieson. Legal and financial arrangements were completed in less than three months.

The merger is one of the most important to take place in the chemical industry in recent years. It's part of the broad expansion undertaken by Mathieson in the past four years in the drive by Nichols and the Mathieson board of directors for greater product diversification, expanded research and development and the opening of new markets.

## Benzoic or Salicylic Used As Carriers in Dyeing Dacron

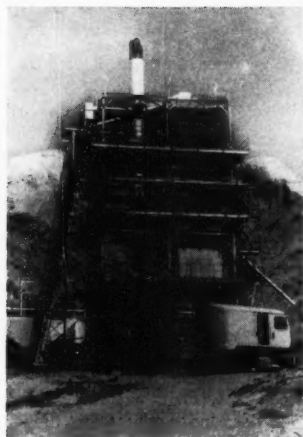
With benzoic acid or salicylic acid as carriers in the dyebath, Dacron can be dyed successfully, thus overcoming difficulties in dyeing the Du Pont synthetic polyester fiber.

"Dacron is very difficult to dye by conventional means because of the hydrophobic nature of the polyester fiber," according to Dr. Franklin Peters of Heyden Chemical Corp., a producer of benzoic acid and salicylic acid.

"Even the preferred dyestuffs, dispersed acetate colors, are poorly absorbed," Peters says, "unless special dyeing techniques are used."

"The most practical dyeing process yet devised involves addition to the dyebath of chemicals known as 'carriers.' Of the many chemicals tested, benzoic acid and salicylic acid have won widest acceptance by the dyer because they most closely approach the properties required in an ideal carrier for the Dacron dyebath."





### New Gas Combustion Retort Will Get Oil From Shale

A new gas combustion retort at the Rifle, Colo., demonstration plant of the Bureau of Mines will employ a novel continuous extraction process to get oil from shale. The new retorting plant has a daily capacity for handling 150 to 400 tons of oil shale.

Built by Blaw-Knox Co. under a \$333,870 contract, the unit is patterned after a 6-ton-a-day pilot plant that has proved the gas combustion process the most efficient and economical extraction process yet developed at Rifle.

A series of "dry runs" will be made before the new retort is fired and placed in operation about January 1. By then, a raw shale storage and distribution system, being built for this retort by Blaw-Knox under another contract, also will be completed.

"If the new retort operates as anticipated," declares Boyd Guthrie, Chief of the Bureau's Oil-Shale Demonstration Branch, "we have an excellent chance of producing crude shale oil at a cost competitive with natural petroleum."

Major objectives of the retorting plant are: (1) to determine cost and yield data for accurate evaluation of the gas combustion process; (2) to provide the technical information that industry will need to design commercial plants; and (3) to supply crude shale oil in the quantities required for the Bureau's refining research.

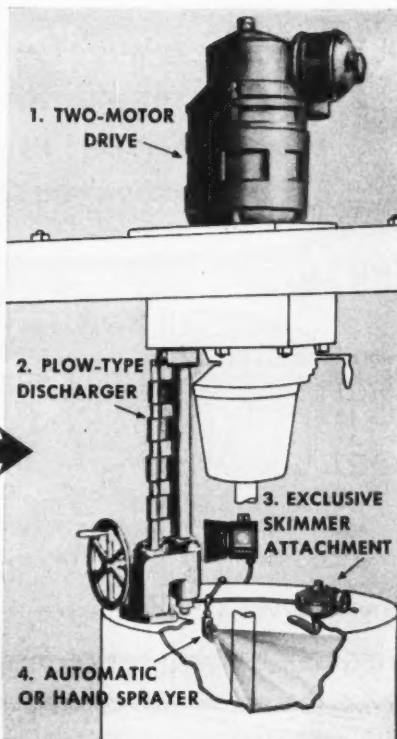
The gas combustion process has two novel and important features, Guthrie says.

First, the process gets its name from the fact that it produces and uses as a

# SEE THE one way

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### CENTRIFUGING with **A.T. and M.** IS FASTER, CHEAPER MORE PRODUCTIVE



Centrifugal force leads the way to new processing efficiency . . . and only from AT&M do you get *all* the features that mean the greatest savings.

**Two-Motor Drive** provides a perfectly controlled fixed unloading speed with maximum safety. Its built-in oiling system requires no pumps or check valves. **Flow-Type Discharging Equipment** gives complete plow control throughout cycle, prevents lost motion and saves time with adjustable stops

in every direction. **Exclusive Skimmer Attachment** removes surface liquid from solids, produces a drier cake, reduces aeration to a minimum. Trouble-free, compact, **Automatic or Hand Sprayer** measures amount of alcohol or water used for washing. Automatic sprayer functions at pre-determined time.

Investigate this modern method for separating, extracting, clarifying and other processing.



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Prove to yourself what efficiencies and savings can be gained in your processing. Send us a sample of your material for centrifuging to your specifications . . . or you can rent a laboratory AT&M at a very moderate rate. (Rental fees apply to ultimate purchase price.) Write for particulars.



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Separation ☐ Extraction ☐ Dehydration ☐ Clarification ☐ Coating ☐ Filtration ☐  
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SAVE TIME, SPACE  
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## **A.T. and M.** CENTRIFUGING

Name.....Title.....

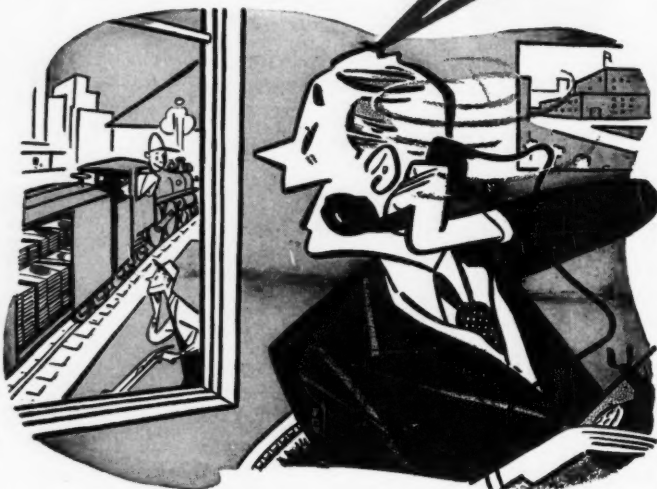
Company.....

Street.....

City.....Zone.....State.....



**HELLO... BEMIS? I WANT TO ORDER A  
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YOU THINK... OH! HERE THEY ARE!  
WHAT TOOK YOU SO LONG?**



Don't pin us down to that, please. But, no fooling, the twelve Bemis multiwall plants, strategically located coast to coast, mean that at least one is conveniently close to you. This time-saving means money-saving. Ask your Bemis Man for details.



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News, cont. . .

source of heat for retorting a low Btu. gas obtained from the shale and burned in the presence of air.

Second, unlike most other retorting processes, it requires neither water nor an elaborate system for condensing the liquid products that come from the retort as a mist. Water, of course, is a scarce and valuable commodity in the semi-arid border region of Colorado, Utah and Wyoming, where the nation's major oil-shale reserves occur.

Even more important, Guthrie says, investment and operating costs for the new process will be substantially lower than those for other processes tested at Rifle, and product costs thus also will be lower.

Crushed oil shale is fed into the top of the vertical retort and moves downward by gravity against a rising stream of gas. Air is injected near the center of the vessel and the gas burned to provide heat for retorting. As the rising gas from the combustion zone and the downward moving shale pass each other, the shale is heated and the gas is cooled. Upon leaving the retort, the oil-mist laden gases pass through an oil-collecting system. Part of the gas is returned to the bottom of the retort, where it is preheated by spent shale before entering the combustion zone. The large volume of excess gas remaining could be burned to generate heat or power for other purposes.

## Seaborg Accepts Bid From GI Chemical Engineers

Dr. Glenn T. Seaborg, Nobel Prize winner and professor of chemistry at the University of California, discussed the transuranium elements at the recent meeting of the Enlisted Specialists Chemical Engineering Club at the Army Chemical Center in Maryland.

Brigadier General William M. Creasy, Commanding General, Research and Engineering Command, at the Army Chemical Center authorized all enlisted scientific and professional personnel to attend the meeting as a furtherance in their professional development.

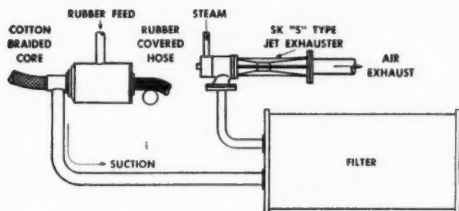
Retiring members of the executive committee presented a resume of achievements, and also proposed future plans for expanding and improving the club's activities.

Among these achievements have been the investigation and proposed



# News

## JET EXHAUSTER CRACKS PRODUCTION PROBLEM IN MANUFACTURE OF RUBBER HOSE



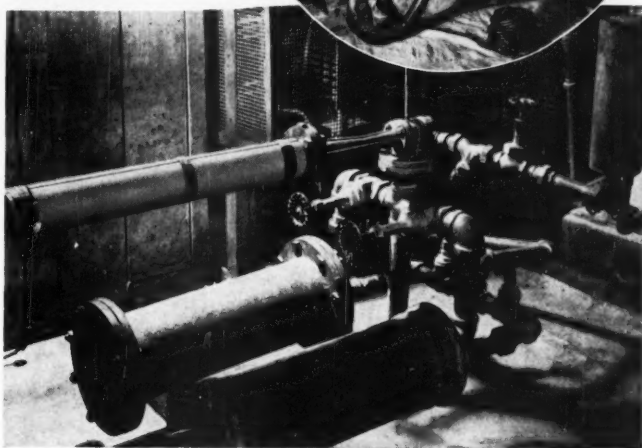
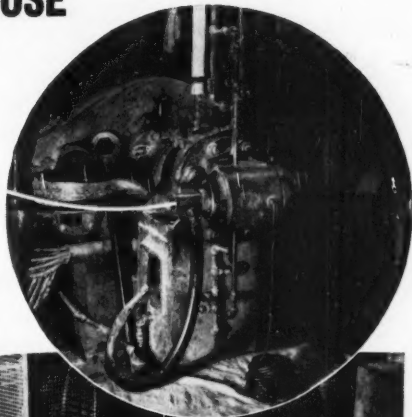
Jet apparatus, outstandingly simple in construction and reliable in performance, possesses definite advantages in priming, exhausting, evacuating, cleaning, transporting, compressing, and agitating fluids. While already widely used throughout industry, new applications are constantly being developed. Whenever possible, we at SK try to disseminate jet application information to the process industry in the hope that such material may suggest a means of solving problems even if not of a directly related nature.

Thermoid Rubber Company engineers recently applied an SK Type "S" Jet Exhauster to a phase of a process designed for use in manufacturing rubber hose. To the part of the manufacturing unit where plastic rubber must be drawn in and applied tightly and uniformly around a braid-reinforced rubber core, they attached a hose. This hose was connected to two filters and was then connected to the suction connection of the exhauster.

Using steam as the operating medium, the exhauster maintains consistently strong suction of 24"-26" Hg.—sufficient to cause the rubber to be drawn into the unit and properly applied around the braid-reinforced core.

The highly satisfactory performance of the exhauster has practically eliminated production problems during this phase of the operation and has displayed great superiority over the mechanical apparatus previously used.

▲ This diagram shows how Thermoid Engineers applied an SK Jet Exhauster to create required suction.



As shown above, suction, created by the exhauster (lower photo) draws plastic rubber into the unit and around the hose core.

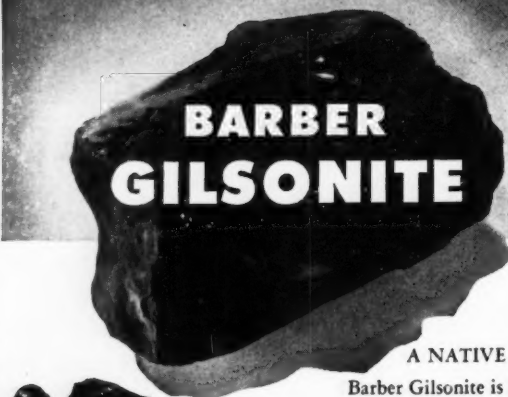
For our "Index of SK Products" which lists the various technical bulle-

tins describing the many types of SK Jet Apparatus, write to us.

*Manufacturing Engineers*

## INVESTIGATE THE UNUSUAL PROPERTIES OF

# BARBER GILSONITE



A NATIVE ASPHALTITE,

Barber Gilsonite is hard, glossy,  
brittle, and has an extremely  
high melting point. Chemically inert,  
Barber Gilsonite may have important  
values in your processes. We'll be glad  
to supply samples and specific data  
promptly on receipt of your request.

## 5

### USEFUL GRADES

BARBER GILSONITE SELECTS L  
Melting Point Range 270-300° F.

BARBER GILSONITE SELECTS PULVERIZED  
Melting Point Range 280-310° F.

BARBER GILSONITE SELECTS VH  
Melting Point Range 325-365° F.

BARBER STANDARD GILSONITE S  
Melting Point Range 280-310° F.

BARBER STANDARD GILSONITE E  
Melting Point Range 335-375° F.

### IMPORTANT INDUSTRIAL USES

**BUILDING MATERIALS** • Barber Gilsonite is used as an important ingredient in building materials: floor tiles; building boards and paper; protective coatings and roofing lines.

**MOLDED PRODUCTS** • Barber Gilsonite is a principal component in battery cases and other thermoplastic molded products.

**ELECTRICAL PARTS** • For its high insulating value, Barber Gilsonite has wide application in electrical products and insulating varnishes.

**SPECIAL APPLICATIONS**  
Wax and rubber compounds  
Printing Inks • Sounds and  
weather-proofing materials • Pipe  
Coatings • Chassis paints • Brake  
and clutch linings.

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St. Louis 17, Mo. Mobile, Ala. Baton Rouge 2, La. Tucson, Ariz. Inglewood, Calif.  
Oakland 1, Calif. Portland 7, Ore. Seattle, Wash. Washington 6, D. C. San Juan 23, P. R.

News, cont. . .

recommendations as to scientific and professional status in the Reserve, preparation and issuance of a directory of scientific and professional personnel at the Army Chemical Center, the successful operation of an SPP Placement Committee, and addresses to the club by several prominent speakers.

These pioneer efforts by the Enlisted Specialists Chemical Engineering Club have resulted in the creation of a number of similar groups now in operation at Dugway Proving Ground, Aberdeen Proving Ground, Fort Belvoir and Camp Detrick.

**Tablets Galore:** A compressing machine that spews out 1 million tablets of any type within 24 hr. is operating at the Buffalo, N. Y., pharmaceutical plant of Amer Co. The compressor has 36 punches and a rated capacity twice that of an ordinary tablet machine.

**Oil Extraction:** Blaw-Knox Co. will install a Rotocel extraction unit for processing 500 tons per day of soybeans at the Mankato, Minn., plant of Honeycomb Products Co. This will double capacity of Honeycomb's solvent plant and replace its expeller operation.

**Carbon Bisulphide:** Construction will be completed late this fall by H. K. Ferguson Co. on the new carbon bisulphide plant of Stauffer Chemical Co. Being built on a 47-acre site north of Mobile, Ala., the plant will employ 25 to 30 people. Its design incorporates the most modern and efficient devices for control of air and water pollution.

**Sulphur Recovery:** Standard Oil Co. of Indiana is now extracting hydrogen sulphide from byproduct fuel gases in a new plant at its Whiting, Ind., refinery and converting it into sulphur of 99.9 percent purity. Most of the Whiting production of 55 tons per day of sulphur will be converted to sulphuric acid for use in alkylation and treating operations.

**Expansion Capital:** Allied Chemical & Dye Corp. has borrowed \$50 million from New York banks. The loans, on unsecured notes for three years, will bear interest at 3 percent, and Allied can pre-pay them at any time without premium.

Money will be plowed into an expansion program that has cost Allied \$226 million of its own funds in the six years from 1945 to the end of 1951. Present plans call for an outlay of about \$75 million this year for construction and a like amount next year.

**Resin from Stumps:** With Dixie's pine stumps pretty well rooted out, Hercules Powder Co. is turning to cutover pine lands of the Northwest as a new source of stumps for resin making. In a pilot plant at Klamath Falls, Ore., Hercules is trying to find out if resins can be extracted commercially from ponderosa pine stumps of the Deschutes Basin. Operating from a camp near Bend, Ore., Hercules workers are uprooting stumps from cutover pine land logged 30 years ago. *End*

#### MEMO

Continued from page 141

"Then without warning an overhead crane tipped over a ladle of molten aluminum. Three tons of red hot metal plummeted to the floor a few feet in front of us. I was too busy getting the hell away from there to see the real fireworks. The first casting had been poured, no doubt about that, but not in the mold. The only damage was some mighty scared people and a few mighty red faces!"

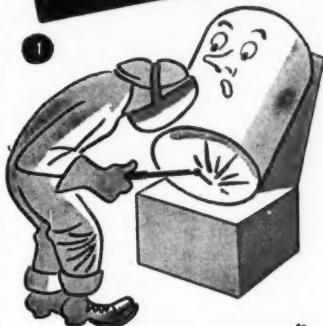
Little incidents like this are something every plant-visiting editor can expect to chalk up to his experiences from time to time. (They make good conversation pieces—afterwards!)

► **Friendly Meetings**—The South Texas section of the AICHE, Jim says, is about the friendliest he has ever known.

One reason for this, he believes, is the practice of having a social hour before each monthly dinner-technical meeting. Then too, there is the annual picnic in the summer and the all-day technical section at Galveston every fall.

Jim has been active in this local section of the AICHE ever since he went to Houston in 1949, was elected secretary within a few months of his arrival. He is also a member of such organizations as the Houston Chemical Club and Houston Engineers Council (on which he represents the AICHE). *(Continued)*

## FABRICATING YOUR STAINLESS STEEL EQUIPMENT *Is no cinch!*



"Not too hot, please"



"Shine 'em up"



"Inspect my seams again, pal"

① Not too much heat — not too little in the welding arc! Stainless steel is tricky to fabricate. Our experienced welders know that improper welding temperature reduces corrosion resistance at the seams. Blickman-controlled welding procedures give you sound, corrosion resistant welds.

② Get just the right finish for your application. Working exclusively with stainless steel, we have ALL the tools to produce a finish assuring quicker cleaning of your vessel.

③ Double check the inspection procedures of your fabricator. Knowing that the properties of the alloy can be impaired during fabrication, we have established rigid shop procedures and inspection methods as an extra guarantee of soundly built vessels.

When you need stainless steel equipment, call in a fabricator who knows how to handle this alloy in his shop.

**S. BLICKMAN, INC.**  
Guards Alloys in Fabrication

#### SEND FOR THIS VALUABLE BOOK

A request on your letterhead will bring our guide, "What to Look For When You Specify Stainless Steel for Your Processing Equipment."

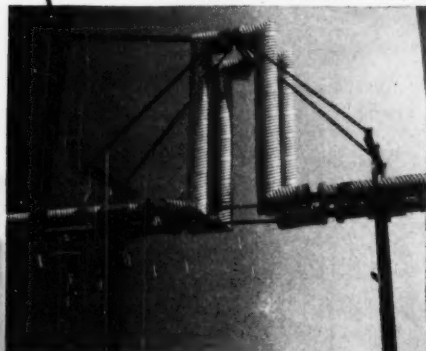


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# PIPING VISCOUS MATERIALS?

**HERE'S HOW** A LARGE PRIMARY ALUMINUM PRODUCER SOLVED PITCH FLOW PROBLEM WITH RIC-WIL UNILINE INSULATED PIPING



*Design requirements for this overhead pitch handling system called for an insulated pipe conduit capable of heating the pitch from its solid state at 25° F. to a minimum pumping temperature of 285° F. and maintaining this temperature.*

**PITCH PIPING—  
STEAM TRACER LINE  
UNILINE INSULATION  
PROTECTIVE CONDUIT**

THE temperatures required are efficiently maintained in Ric-wil's Uniline System. Pitch piping is nested with a steam tracer line inside an insulation liner which insulates the pipes from the exterior but not from each other. The emission of heat from the steam tracer keeps the pitch in a free-flowing liquid state and at the desired temperature. The entire system is housed within a protective conduit of 16-gauge Armco ingot iron, helically-corrugated and hot-dipped galvanized.

Ric-wil Uniline Systems are also used to maintain proper flow in piping oil, asphalt, molasses, and many other viscous materials — underground or overhead. Pipe lines subject to corrosive conditions may be coated with Ricwilite, a baked-on phenolic resin having outstanding corrosion resistance and durability.

Scientific design of Ric-wil Insulated Piping, completely prefabricated with all accessories required, assures high thermal efficiency and speedy, low-cost installation.

- Write for our latest catalog, or contact us for full technical information on Ric-wil as applied to your piping problem.



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Mfgs. Insulated Piping and Conduit Systems  
UNION COMMERCE BLDG. • CLEVELAND, OHIO

**LEADERS IN INSULATED PIPING PROTECTION**

MEMO, cont. . .

► **Knows the Industry**—Behind Jim's love for the Southwest is the fact that he has known it—and known it well—for many years. Even when he was located in our New York office (he joined us in 1928) he specialized in following closely the industrial development of the area. And as our managing editor from 1933 until he moved to Texas in 1939, Jim visited the Southwest regularly and wrote many feature articles and reports on it and its chemical processing plants.

And Jim's many years of active participation in national professional societies naturally led him to know many chemical leaders in the Southwest and to feel at home in the region's alkali, petroleum and pulp and paper industries.

He has long been active in the materials of construction field, served as chairman of TAPPI's materials of construction committee and is author of the McGraw-Hill book "Materials of Construction for Chemical Process Industries." In 1948 he was elected president of the Electrochemical Society. He has also held important offices or chairmanships in the AIChE, TAPPI, ASTM, SPI and other professional groups.

Jim received his undergraduate education at Washington & Lee University. He followed this with a B.S. from MIT and an M.S. from Columbia, both in chemical engineering.

Following service with the Chemical Warfare Service in World War I, Jim spent a year with the Citizens Gas Co. of Indiana, then entered the research and development department of Bell Telephone Laboratories where he remained until he joined us in 1928.

► **Heart in Texas**—A couple of years ago Jim and I were driving down to the Corn Products Refining plant at Corpus Christi. On the way we began to talk about his experiences, the industries he had followed, the plants he had written up for *Chemical Engineering*, the places he had visited, the areas he had lived in.

"Of all the places and areas and cities you know," I asked, "which one do you like best?"

"This area," he said, "Texas and Houston specifically."

And from my limited knowledge of the region I appreciated why he felt that way.

—End



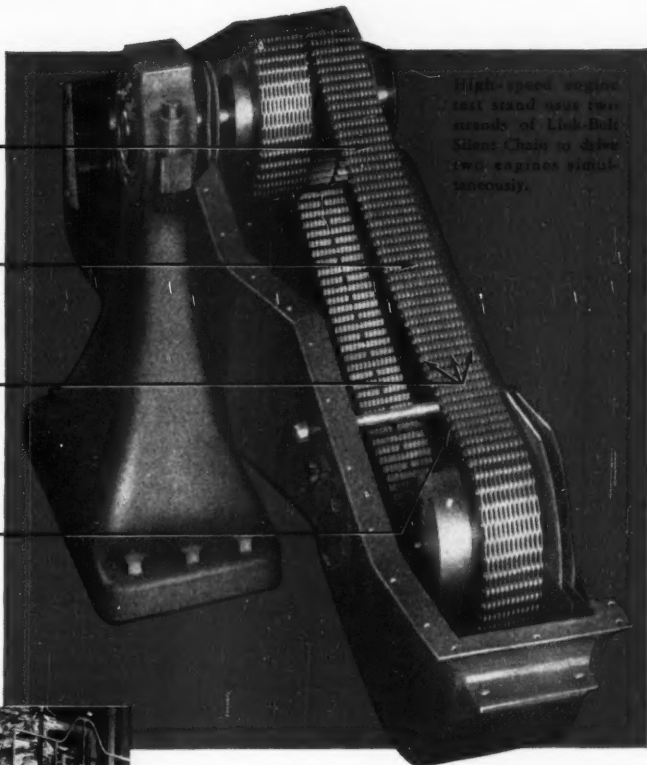
# Choose the proved way to transmit high hp at high speeds

Silverstreak Silent Chain does the job with a single strand—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.

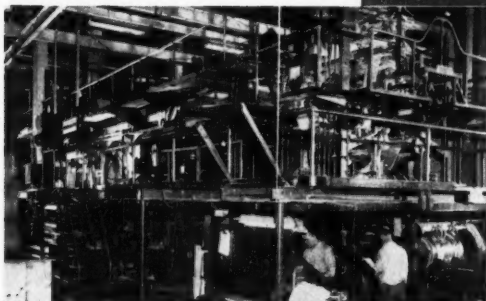
Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.

"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.

Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.



High-speed engine test stand uses two strands of Link-Belt Silent Chain to drive two engines simultaneously.



Four 125 hp Silverstreak Silent Chain Drives power this press on which 46% of all "Reader's Digest" copies are printed. Chain speeds of 4600 fpm are maintained 24 hours a day, six days a week.



**SILVERSTREAK SILENT CHAIN DRIVES**

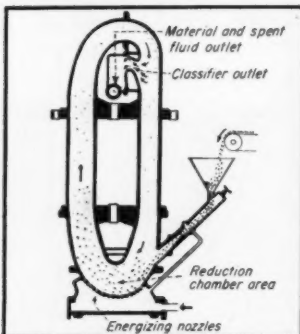
## LINK-BELT Silverstreak Silent Chain Drives are slip-proof ... slap-proof ... shock-proof

For the finest in modern power transmission, use Silverstreak Silent Chain the next time you have a demanding drive problem. These long-life drives—more than 98% efficient—have met every test for rugged service. There are many applications where Silverstreak Silent Chain has been in continuous operation for 15 years and more ... without replacement ... with only routine attention. Call the Link-Belt power-transmission engineer in the office near you for any information you require.

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12,003

## Readers' Views & Comments



### Fluid Energy Mill

Sir:

We have read with considerable interest your August report on "Size Reduction." It has been noted that you used on p. 164 a cut showing the cross section of the latest design C. H. Wheeler fluid energy reduction mill, yet we have not been given credit for the use of this drawing.

This cut (above) illustrates the most advanced of the work done by N. N. Stephanoff, manager of our fine particles processes department, who is the inventor of this jet-type mill and who holds numerous patents on this type equipment. Mr. Stephanoff is currently engaged in further development work.

We very much regret the oversight which has apparently taken place.

H. R. BAKER, JR.

C. H. Wheeler Manufacturing Co.  
Philadelphia 32, Pa.

►CE readers interested in details on the design and operation of Wheeler's earlier design "motionless" mill can refer to the story in our February, 1950 issue (p. 142). For more recent information on up-to-date performance, consult C. H. Wheeler Manufacturing Co. in Philadelphia—Ed.

### The Other Side of the Fence

Sir:

My major interests are in details of new processes, with special emphasis on the new features of operations, equipment design and engineering setup.

Some of your articles do not contain these details and I, quite frankly, am

very critical of you because you don't put them in. . . .

S. A. HEYDEN

Chemical Engineer  
Inglewood, Calif.

►Here's a fact that's practically axiomatic among editors: The newer, more novel, more significant a process development, the tougher it is to persuade any private firm to pass out the precious details of its know-how.

That's understandable, I'm sure, for it comes back to one question: If you spent a lot of time and money on developing something new that gives you an edge over your competitors, would you be willing to give it away?

In developing our stories we naturally try to persuade the firm we're working with to give us as many details as they safely can. We press the matter up to a certain point—the point beyond which we feel that real damage could result. Sometimes we reach that point; sometimes we fall short.

I'm sure that very few of our readers in industry would ever insist that we damage any firm by deliberately passing that point of "safe disclosure." The \$64 question, of course, is this: Just exactly where is that point?

What are your ideas on it?—Ed.

### Every 9.7 Years

Sir:

The article "How Calco Streamlined Chemical Plant Maintenance" by Stuart Whitehead in your August issue (p. 167) is certainly one of the most constructive I have ever read.

It is obvious that Mr. Whitehead knows his subject and has analyzed it carefully. . . . I am glad to see a chemical publication give serious attention to the problem of plant maintenance; it has been neglected too long.

At the three chemical plants I supervise . . . we found that maintenance costs added up to the initial equipment investment on the average about every eight years. Our current program to cut maintenance costs has reduced this "maintenance cycle" to 9.7 years . . . but Mr. Whitehead's constructive ideas will help us do even better.

NAME WITHHELD

Works Manager  
New York, N. Y.

►The article our reader refers to describes how planned maintenance at Calco's

Bound Brook plant increased productive time of crews doing field work from 54 to 74 percent. It's based on a decentralized craft organization.—Ed.

### Energy Economics

Sir:

Your recent book of reprints "Data and Methods for Cost Estimation" is proving valuable to me in my cost estimating work. One subject, though, doesn't seem to be covered . . . electric power.

I'm wondering if you have covered this subject in Chemical Engineering or if you plan to have something on it soon?

CHARLES R. ANDERSON

Chemical Process Engineer  
Orange, N. J.

►Yes, we do plan to cover this subject—and soon, too.

In February, we'll publish an article—especially prepared for CE—on the economics of electric power generation. This will be followed in March by a companion article on the economics of electric power distribution. Both are aimed at the chemical engineer in process industry plants.—Ed.

### Cathodic Engineering

Sir:

Approximately 85 percent of the text of the article entitled "Cathodic Engineering Preview" published in your July 1952 issue (pp. 220-221) follows word for word material of which I am the author, and which was published during 1951 in the *Oil and Gas Journal*. Even the illustrations are obvious adaptations of those which accompanied my articles. Will you please explain this situation to your readers?

MARSHALL E. PARKER

Consulting Engineer  
Houston, Tex.

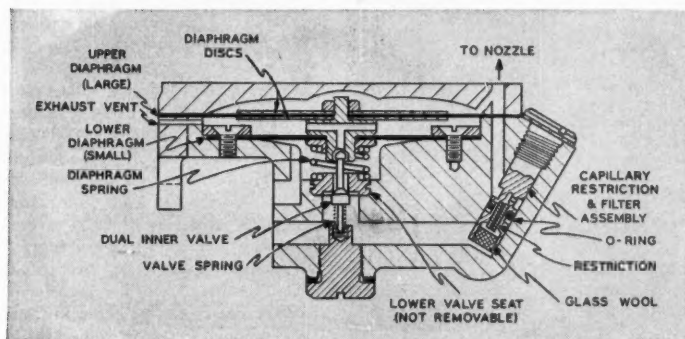
### We Reply

Enclosed with Mr. Parker's letter were tear copies of his excellent series of copyrighted articles which were published by *The Oil and Gas Journal* in more than 30 installments during 1951 under the general title "Corrosion and its Control." Also enclosed was a photostatic copy of the Nicholas  
(Continued)

# A Superior Controller must have a Superior Relay

you get it in the

## P-4 PNEUMATROL Pneumatic Controller



**HOW IT WORKS:** When flapper is moved against nozzle by measuring system, pressure increases on top of large diaphragm. Floating exhaust seat moves downward pushing lower or inlet valve open increasing pressure in output circuit and under small diaphragm until balance of forces closes the valve. Conversely when nozzle is vented, the diaphragm system moves upward to open exhaust valve, reducing pressure in output circuit until equilibrium is again established.

The F&P FLOWRATOR meter was the first flow rate meter generally available to exhibit instantaneous response to flow rate change, leading to control problems that have been presented by current mechanical differential type flow transmitters.

Rapid response of the control valve is essential for stable control in a system which changes rapidly. Since the control valve action depends upon the capacity of the relay supplying it with air, the requirement for a high capacity stable relay required solution. Consequently, the P-4 relay has been designed to be extremely fast without impairing its basic sensitivity due to hydrostatic unbalance. The P-4 relay utilizes tandem slack diaphragms which provide the multiple requirements of high capacity, low air consumption "on control", and freedom from all dead zone. Write now for Catalog C-50.

### 9 POSITIVE BENEFITS

**Versatility**—one relay fits transmitter, and all case and point-of-measurement controllers.

**Integral unit**—permits fool-proof construction without tubing connections.

**High capacity**—essential for best in flow control.

**Rated capacity**—2 cfm @ 1 psi drop.

**Capacity fully usable**—transfer switch ports and connectors match relay high capacity.

**High force**—friction ratio—large diaphragm area produces maximum sensitivity.

**Amplification**—4:1 pressure multiplication of tandem diaphragms permits low nozzle pressure, low reaction pilot system.

**Protected Pilot**—integral filter assembly features stainless steel restriction and nozzle.

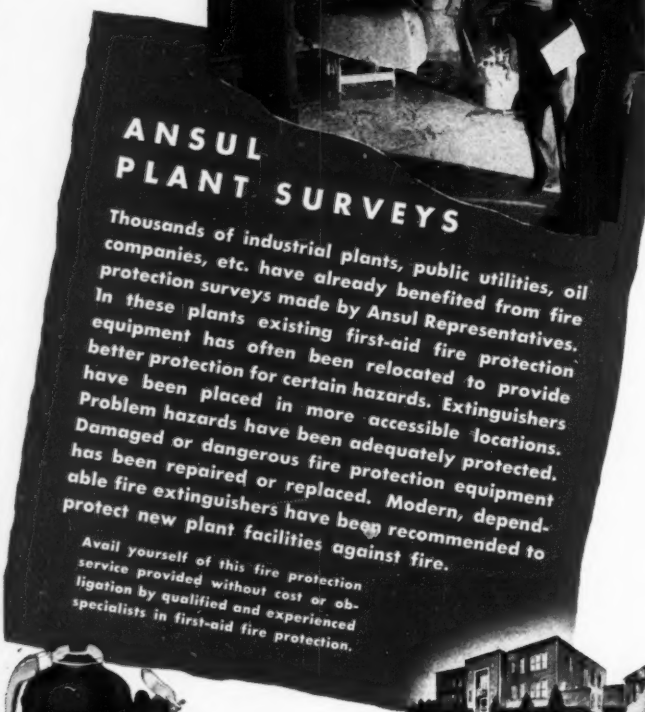
**Non-bleed**—no dead zone assured by tandem diaphragm and floating exhaust seat construction.

**Materials**—aluminum die cast body with brass insert, neoprene diaphragms. Trim, springs and screws of stainless steel.



# FISCHER & PORTER CO.

610 County Line Road, Hatboro, Penna.



MODEL 30-B

No. 3 of a series of 6

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Chemical Company

FIRE EQUIPMENT DIVISION • MARINETTE, WISCONSIN

Send for File No. 334. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units. Also included is additional information on Ansul Services.

FRANCIS G. HOOD MEMORIAL BLDG., MARINETTE, WIS.

## READERS' VIEWS, cont. . .

article identifying sentence by sentence the original sources of most of its content.

Naturally the situation is one of regret and embarrassment on our part. And since the author refuses to offer an acceptable explanation, we have no choice but to present herewith the circumstances surrounding this unfortunate situation:

Thomas E. Nicholas, writing from 2911 Palm Street, San Diego, Calif., prepared his manuscript for another McGraw-Hill publication, offering it "on an exclusive first-hand basis only." Following review by their editors and ours, it was decided that the subject was more appropriate for *Chemical Engineering*. Permission was therefore obtained from the author. In answer to our inquiry about his background and experience, he informed us that he was a consulting engineer engaged in design, development and patent work, and that he held a bachelor of science degree from Illinois Institute of Technology and, in addition, had studied law for three years at LaSalle in Chicago.

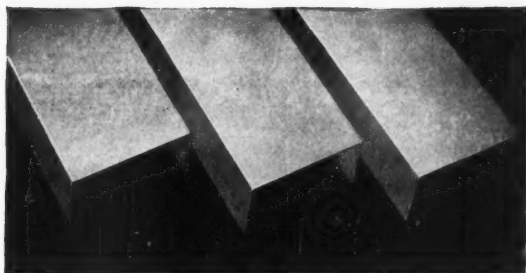
On the basis of this letter and further information developed through our Los Angeles office, the article was accepted in good faith and published by us in approximately the form submitted. Payment was made at our usual space rates.

Subsequently, Mr. Nicholas objected strenuously as to the amount of the check. Writing from San Diego, again on the stationery of a consulting engineer, he refused acceptance of our check as payment in full. From his legal knowledge and background he wrote as follows:

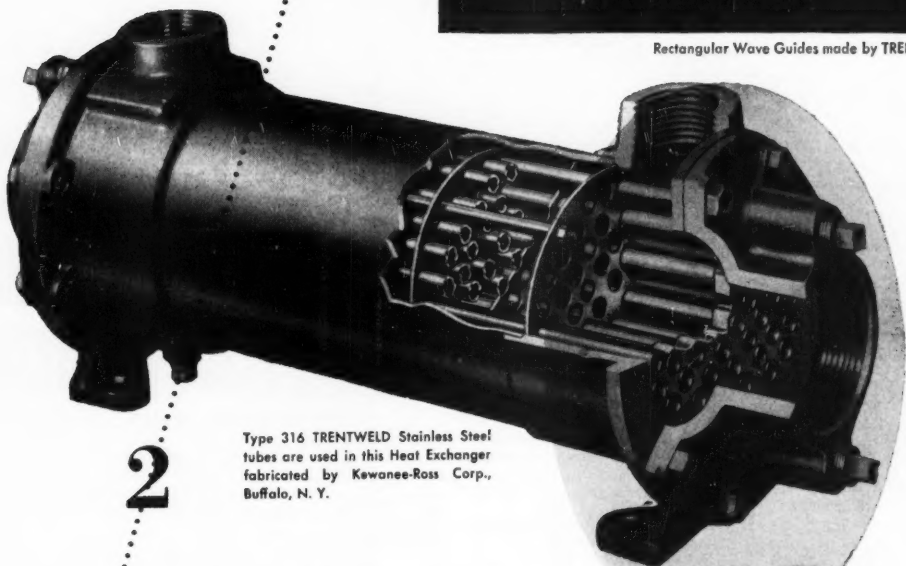
"The law of the land states that reasonable payment must be made. I do not consider the above amount reasonable for the amount of skill, knowledge and time expended in producing it, nor do I wish to relinquish all future rights in my article on Cathodic Engineering unless reasonable payment is made for the same."

Obviously we do not intend to make any further payments to Mr. Nicholas. Nor will his contributions be welcomed in our pages. But we are deeply concerned and extend our apology to our worthy contemporary, *The Oil and Gas Journal* and to its distinguished contributor, Marshall E. Parker, consulting engineer.—S. D. KIRKPATRICK

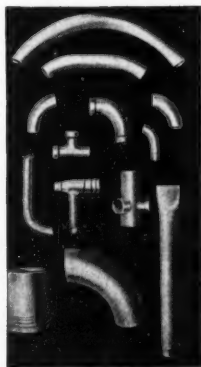




Rectangular Wave Guides made by TRENTWELD



Type 316 TRENTWELD Stainless Steel tubes are used in this Heat Exchanger fabricated by Kewanee-Ross Corp., Buffalo, N. Y.



A baker's dozen of fittings made from TRENTWELD tubing

**TRENTWELD**

## STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

CHEMICAL ENGINEERING—November 1952

*any need for stainless or high alloy steel tubing is better served with **TRENTWELD***

Name the need for special types, forms or finishes of stainless or high alloy steel tubing and the name to associate with it is TRENTWELD. For throughout all industry you'll find TRENTWELD meeting exacting requirements in these highly specialized fields. That applies to stock lines in food, paper and chemical plants. It is true of heat exchanger units in processing industries; and in cooling coils in breweries, the beverage industry, dairies and dairy equipment.

TRENTWELD is available in a wide range of wall thicknesses; in a variety of grades, gauges and finishes. Call us for any requirement in stainless or high alloy tubing. Our engineers can help you.



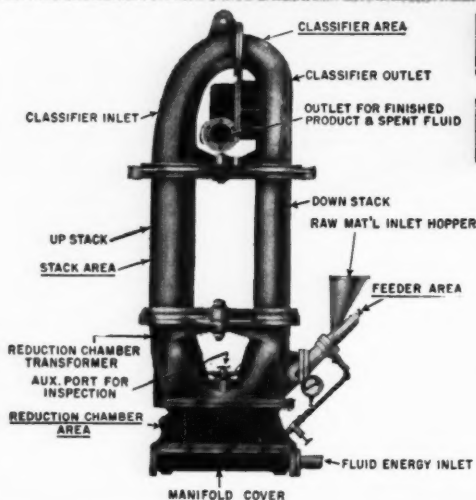


**"MOTIONLESS" MILL GRINDS PARTICLES**  
as low as 100 times finer than the human eye can see

## FLUID ENERGY MILL

**NOW AVAILABLE WITHOUT**

**LEASE OR ROYALTY**

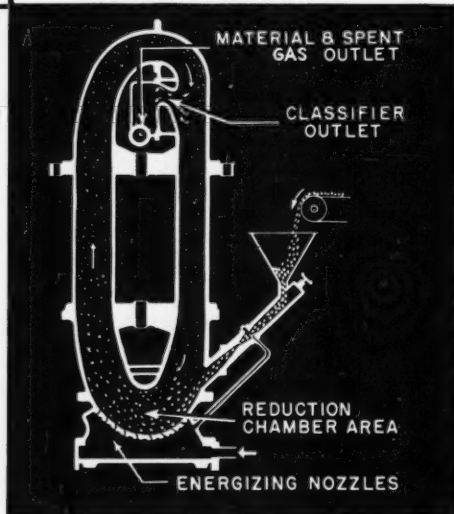


### HOW FLUID ENERGY WORKS

The Wheeler Fine Particle Mill is motionless in that it has no moving parts. Material at approximately 4 mesh or less is fed in at a controlled rate and entrained by energized fluid (air, steam or any gas or vapor) traveling around the reduction chamber at sonic or supersonic velocities. Particles break themselves up by repeated shattering against each other. When they reach desired size (micron or sub-micron) they escape with spent fluid through the classifier outlet into collectors of Wheeler design. Centrifugal force keeps the coarser particles toward the outside of the circuit until they grind each other down.

### FEATURES OF C. H. WHEELER FINE PARTICLE MILLING

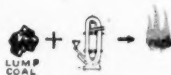
1. No moving parts. No rapid wear.
2. Continuous reduction for continuous processing.
3. Micron particle sizes far below the limits of the finest mesh of mechanical methods—as low as  $\frac{1}{2}$  micron average particle size.
4. Lower cost per ton over mechanical grinding in sizes below 44 microns.
5. Ideal grinding "climate" possible by controlling temperature, velocity, humidity, and type of fluid medium.
6. Better than 98% collection in patented, compact Cyclone Dust Collectors.



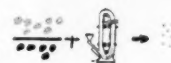
**C. H. WHEELER MANUFACTURING CO., 1838 Sedgley Ave.,**

## HAS MANY USES IN CONJUNCTION WITH GRINDING

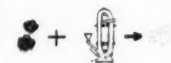
**DRYING:** Use of air or superheated steam as the fluid medium removes moisture from the product, combines particle reduction with drying.



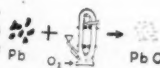
**COATING:** By controlling "climate" and feed rate, sprayed coating or dust coating of fine particles can be accomplished during the process of reduction.



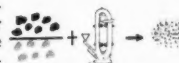
**BREAKING UP AGGLOMERATES:** Small particles which are grouped in agglomerates can be dispersed economically.



**CHEMICAL REACTIONS:** By controlling "climate" and conditions of feed, chemical changes can be effected and regulated.



**BLENDING OR MIXING:** Blending and mixing of ingredients for a wide variety of products can be combined with the process of reduction.



**SIZE CLASSIFICATION:** Automatic size classification is an inherent feature of the mill design. It is further augmented by the unique primary and secondary collectors.



## NEW SUB-MICRON RANGES FOR YOUR GRINDING PROCESS MAY IMPROVE YOUR PRODUCT SEVERAL WAYS

**FINER TEXTURE.** Surfaces of particles become smooth and uniform.



**MORE UNIFORM AND NARROWER DISTRIBUTION RANGE.** By close control of particle size.



**ENDURING SUSPENSION.** With finer, more uniform particles the settling rate in suspension is decelerated.



**A PURE PRODUCT.** Mill wear with its contamination of the product is practically eliminated.

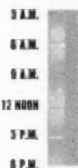


**FASTER REACTION.** The finer the particle the greater the surface area exposed to combustion, absorption, or any other chemical reaction.

**MORE UNIFORM COLOR.** Finer particles disperse more uniformly in a vehicle resulting in more uniform color—enhances the appeal of many products.

**EXACT COLOR MATCHING.** Through control of feed materials and operating conditions uniformity found in one period may be duplicated at any other time.

Total Surface Area of a 60 Mesh Particle when reduced to 4 Micron Particles



## ARE YOUR MATERIALS LISTED HERE?

*A partial list of materials reduced to micron fineness in the C. H. Wheeler pilot plant.*

Alumina	Face Powders	Lead and Lead Oxides	Silicon Carbide
Barytes	Feldspar	Limestone	Sulphur and Sulphur
Ceramics	Foods	Magnesium Silicate	Compounds
Clays	Graphite	Metals	Talcs
Corundum	Gypsum	Mica	Titanium Dioxide
Coals	Insecticides	Pharmaceuticals	Waxes
DDT and DDT Mixtures	Iron Oxide	Pigments	Whiting
Diatomaceous Earth	Irons—Sponge and	Resins	Zirconium Silicate
Earthen Pigments	Electrolytic		

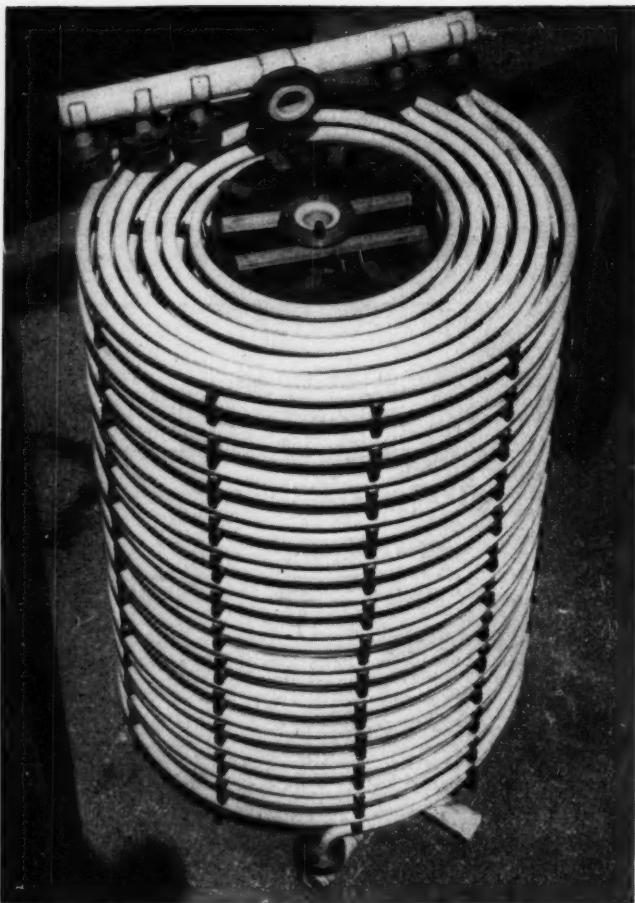
## OUR PILOT PLANT RUNS SIZEABLE SAMPLES

The above are just a few of a 1000 tests. We will run a sizeable sample for you at moderate cost for set-up and operating time.

INQUIRIES SHOULD BE ON YOUR COMPANY LETTERHEAD... OR WIRE OR PHONE.



Philadelphia 32, Pa. • Representatives in Most Principal Cities



Six range cooling coil of unplasticized polyvinyl chloride. Welded construction.

## Unplasticized Polyvinyl Chloride

The corrosion resistance of this thermoplastic material of construction to a number of corrosives, with data on physical properties and methods of fabrication.

**JOSEPH L. HUSCHER**  
American Aglle Corp., Bedford, Ohio

The term "vinyl," as generally used in industry refers to those plastic materials which are specifically named "polyvinyl," although such materials as acrylates and polystyrene are correctly classified as vinyl derivatives.

Polyvinyl compounds include the following well known and widely used products: polyvinyl acetate, polyvinyl chloride, polyvinyl chloride-acetate copolymer, polyvinyl alcohol, polyvinyl acetal, and polyvinylidene chloride.

The vinyl family includes several other types which differ from each other only in the nature of the atom or group which is linked to the vinyl radical. The list of derivatives which are of importance in the vinyl family is constantly growing. New types of vinyl ketones and vinyl ethers are coming into prominence, and modifications are being made in the chemical structure of the older types.

Because their fundamental properties can be greatly varied through compounding, these materials occupy the enviable position of covering a wide range of applications such as moldings, extrusions, adhesives, coatings, prefabricated stocks, and more recently in dispersions (plastisols, plastigels, etc.).

### POLYVINYL CHLORIDE

Certainly the most important single vinyl polymer is polyvinyl chloride, which is a thermoplastic, linear macromolecular chain produced by the addition polymerization of vinyl chloride.

Polyvinyl chloride is available as a white or white-yellowish fine powder, which, as thermoplastic material can be processed and fabricated between 350 and 400 deg. F. It does not have a melting point, since it has a tendency to decompose when subjected to heat, liberating hydrochloric acid in an autocatalytic reaction. Suitable stabilizers, which will both neutralize the hydrogen chloride as well as prevent formation of isolated double bonds in the resin molecule, have to be incorporated into polyvinyl chloride compounds for most all applications.

Various applications of polyvinyl chloride are directly connected to its molecular weight, which cannot be measured directly, but only from the relative viscosity of solutions of various polymers.

The processing of pure polyvinyl chloride, containing only stabilizing and internal lubricating agents, though, is not a simple matter. This is especially true of polymers of high molecular weight such as produced in the U. S., which present considerable difficulties if they are to be processed by the conventional methods. The temperature range within which stabilized polyvinyl chloride can be

(Continued on page 273)

**NOW...**  
**Bigger and Better—**



**NEW**  
**SERIES 310A**  
**"KARBATE"**  
BRAND  
**Standard**  
**HEAT EXCHANGERS**



NO! PLEASE!  
 NOT MORE  
 LOW  
 MAINTENANCE!

**DOLLARS AND SENSE...**

point to "Eveready" No. 1050 Industrial Flashlight Batteries... delivering twice as much usable light as any battery we've ever made before. Their unique construction prevents swelling or jamming in the case... has no metal can to leak or corrode.



*The terms "Karbate" and "Eveready" are registered trade-marks of Union Carbide and Carbon Corporation*

**NATIONAL CARBON COMPANY**

A Division of Union Carbide and Carbon Corporation  
 30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

IN CANADA: National Carbon Limited, Montreal, Toronto, Winnipeg

**F**EATURING lower cost per unit area of heat transfer surface, National Carbon's new Series 310A "Karbate" Shell-and-Tube Heat Exchanger replaces the well known Series 240A Exchanger. Retaining all the time-proved advantages of its predecessor, this exchanger also provides new design improvements... products of many years' experience in the application of impervious graphite to heat transfer equipment.

Another new model, Series 90A, replaces the previous Series 70A to provide increased capacity and several new and improved features of construction.

**NO OTHER DESIGN OFFERS ALL THESE ADVANTAGES**

- Lower cost per unit area
- Interchangeable single- and multi-pass construction
- Low tube and shell side pressure drop
- Easy tube replacement
- Factory stock for quick shipment
- Separate and removable "Karbate" impervious graphite fixed and floating end covers
- Rugged Type SN cover connections
- Oversize shell connections—built-in vapor belt and impingement plates
- Removable "Karbate" impervious graphite tube bundle with stainless steel baffles
- Asbestos composition, "Neoprene", or "Teflon" gaskets

**NO OTHER MATERIAL COMBINES ALL THESE PROPERTIES**

- Chemical resistance to practically all corrosive fluids
- High rates of heat transfer (three times that of carbon steel)
- Immunity to thermal shock
- Low maintenance

**OTHER NATIONAL CARBON PRODUCTS**

**Write for New Catalog Section S-6740**

**HEAT EXCHANGERS • PUMPS • VALVES • PIPING • TOWERS • TOWER PACKING • BUBBLE CAPS • BRICK • STRUCTURAL CARBON • SULPHURIC ACID CUTTERS • HYDROCHLORIC ACID ABSORBERS**



**KEY TO CHARTS**

Temperature, °F  
Concentration %

Corrosive

Symbols:  
▲ = Complete Resistance  
● = Some Attack  
▼ = Attack or Decomposition

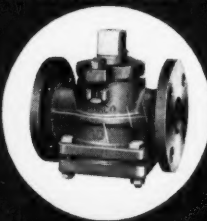
Alums  
Ammonia, Dry Gas  
Ammonia, Liquid  
Ammonium Carbonate  
Ammonium Chloride  
Ammonium Fluoride  
Ammonium Nitrate  
Ammonium Sulphate  
Ammonium Sulphide  
Aniline  
Aniline Hydrochloride  
Anthraquinone  
Antimony Chloride  
Arsenic Acid  
Barium Hydroxide  
Benzaldehyde  
Benzene  
Benzoic Acid  
Borax  
Boric Acid  
Bromic Acid  
Bromine Liquid  
Bromine, Vapor  
Butadiene  
Butyl Alcohol  
Butyl Acetate  
Butyric Acid  
Calcium Carbamate  
Calcium Chloride

Acetaldehyde  
Acetic Acid  
Acetone  
Adipic Acid  
Aluminum Chloride  
Aluminum Hydroxide  
Aluminum Sulphate  
CHARTS CONTINUED ON P.268

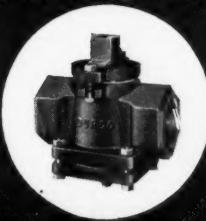


# The Chemical Industry's best defense against corrosion

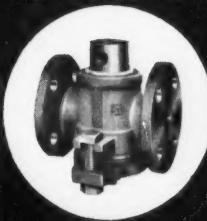
1 1/2" - 2" FLANGED ENDS



1 1/4" - 1 1/2" - 2" SCREWED ENDS



1/2" - 1/4" - 1" FLANGED ENDS  
(also available with screwed ends)



## **DURCO** Type F Valves with Teflon®\* sleeves

In the two years since DURCO Type F Valves were introduced to the Chemical Industry, several thousand have been put into operation and the list of successful applications continues to grow.

DURCO engineers have designed a non-

lubricated valve with no metal-to-metal contact, making use of a Teflon®\* sleeve. This new design, in the correct DURCO alloy, provides you with a valve proven in actual service and operating with minimum maintenance costs.

*Full details in Bulletins V/4 and V/4a*

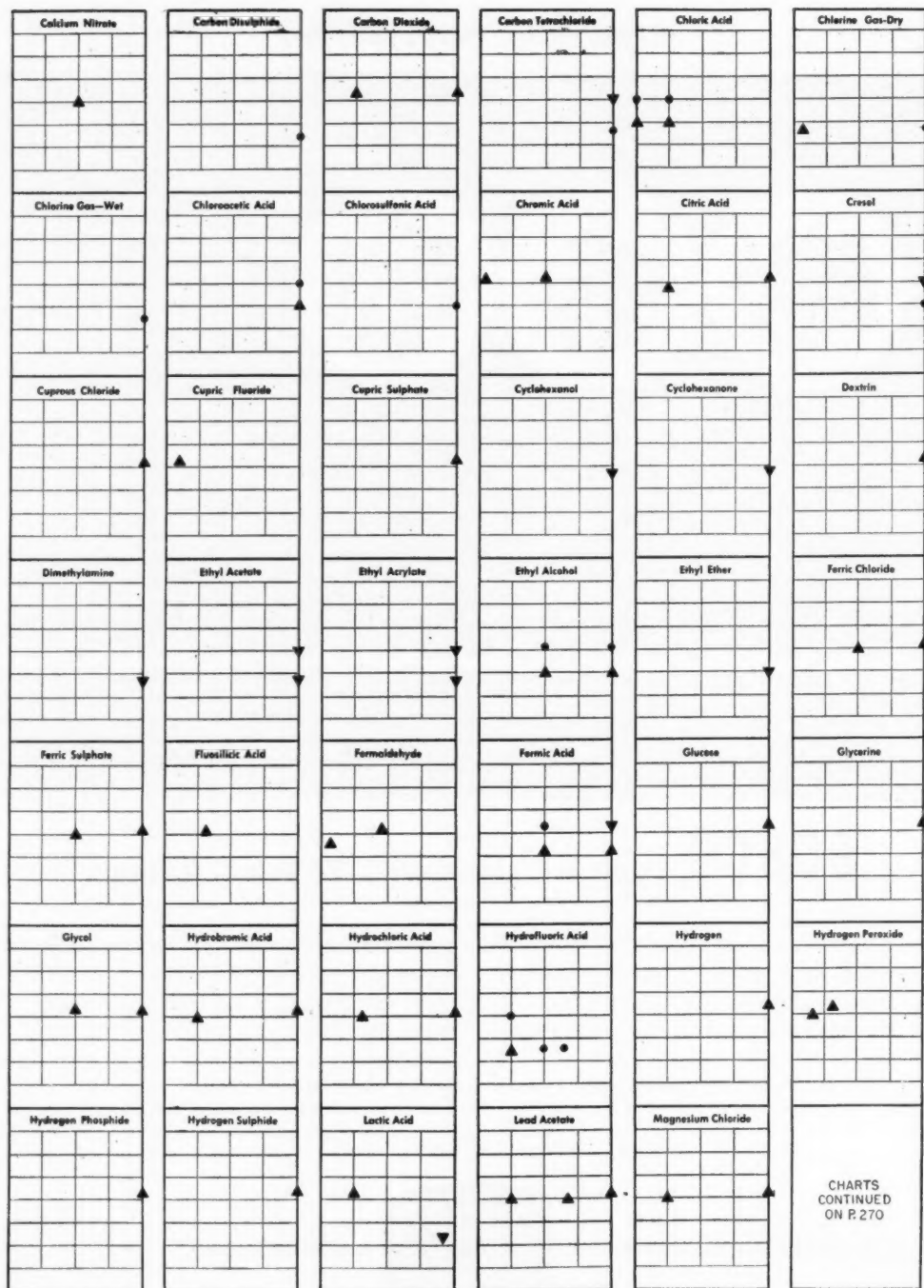
THE DURIRON COMPANY, Inc.



DAYTON 1, OHIO

\*Registered trademark of E. I. duPont de Nemours & Co., Inc., for its tetrafluoroethylene resin.

## Corrosion Resistance of Unplasticized Polyvinyl Chloride (cont.)

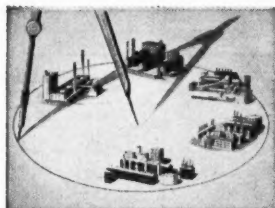


# Call **SOLVAY** First

TRADE MARK REG. U. S. PAT. OFF.



for Soda Ash • Caustic Soda • Caustic Potash • Chlorine  
Calcium Chloride • Potassium Carbonate • Sodium Bicarbonate  
Specialty Cleansers • Sodium Nitrite • Ammonium Bicarbonate  
Para-dichlorobenzene • Ortho-dichlorobenzene  
Monochlorobenzene • Ammonium Chloride



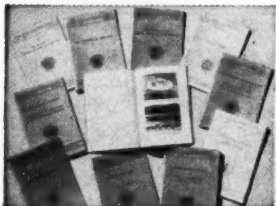
## Call **SOLVAY** First

for prompt and efficient Delivery Service from 5 centrally located plants.



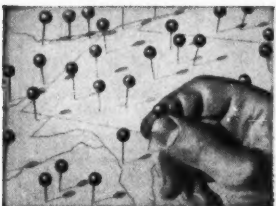
## Call **SOLVAY** First

for an exclusive "industry-wise" Technical Service staffed by individual industry specialists.



## Call **SOLVAY** First

for authentic, information-packed Technical Bulletins.



## Call **SOLVAY** First

for courteous Sales Service from 13 sales offices and over 200 coast-to-coast stock points.

### **SOLVAY PROCESS DIVISION**

ALLIED CHEMICAL & DYE CORPORATION  
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#### BRANCH SALES OFFICES:

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New Orleans • New York • Philadelphia • Pittsburgh • St. Louis • Syracuse

## Corrosion Resistance of Unplasticized Polyvinyl Chloride (cont.)

<b>Magnesium Hydroxide</b>  <b>Methylene Chloride</b>  <b>Oleic Acid</b>  <b>Phenyldiazine</b>  <b>Picric Acid</b>  <b>Potassium Chromate</b>  <b>Potassium Nitrate</b> 	<b>Magnesium Sulphate</b>  <b>Nickel Chloride</b>  <b>Oxalic Acid</b>  <b>Phosgene, Gas</b>  <b>Potassium Borate</b>  <b>Potassium Cyanide</b>  <b>Potassium Perchlorate</b> 	<b>Maleic Acid</b>  <b>Nickel Sulphate</b>  <b>Oxygen</b>  <b>Phosphoric Acid</b>  <b>Potassium Bromate</b>  <b>Potassium Dichromate</b>  <b>Potassium Permanganate</b> 	<b>Methanol</b>  <b>Nicotine</b>  <b>Ozone</b>  <b>Phosphorus, Yellow</b>  <b>Potassium Bromide</b>  <b>Potassium Ferricyanide</b>  <b>Potassium Persulphate</b> 	<b>Methyl Chloride</b>  <b>Nitric Acid</b>  <b>Perchloric Acid</b>  <b>Phosphorus Pentoxide</b>  <b>Potassium Carbonate</b>  <b>Potassium Ferrocyanide</b>  <b>Sea Water</b> 	<b>Methyl Sulphate</b>  <b>Oils and Fats</b>  <b>Phenol</b>  <b>Phosphorus Trichloride</b>  <b>Potassium Chloride</b>  <b>Potassium Hydroxide</b> 
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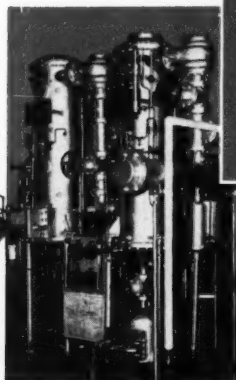
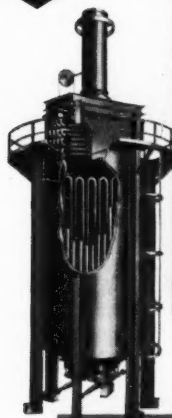
CHARTS  
CONTINUED  
ON P.272



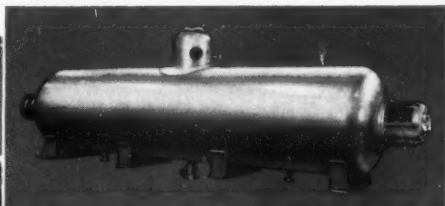
# Chemical Processing Equipment

**FOR THE CHEMICAL, RUBBER, PLASTICS, PETROLEUM AND ALLIED INDUSTRIES . . .**

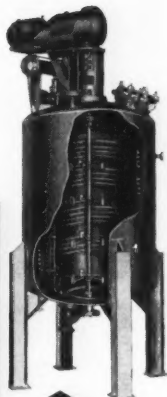
Type CV, vertical circular fired heater.



Double effect evaporator.



34" dia. x 20'4" long shell devulcanizer, 3500 gal. capacity for 400 psi w.p.

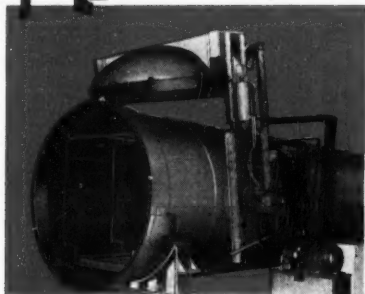


Hydrogenator featuring advanced agitator design for dispersion of gases and solids.

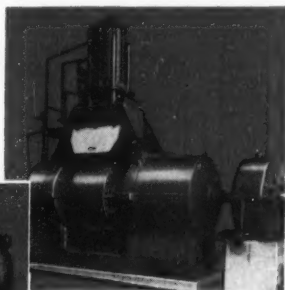
While a large proportion of our equipment is standard in nature and produced in quantity for conventional needs, we have also built a valued reputation, reflected in high production volume, for the most highly specialized stainless steel and alloy equipment built to meet specific requirements. Whether the demand is for comparatively small pieces of special work, or elaborate construction for some of the largest chemical processing plants in the world, we use the Struthers Wells advantages of research, skill and initiative founded on 100 years of experience to deliver really outstanding service. Get in touch with our nearest branch office or directly with the plant, without obligation, when you have *any* problem involving specialized equipment.

Intensive mixer. Other mixers made for handling every type of work.

Heat exchanger . . . we manufacture a complete line for the Chemical Process Industries.



10' I.D. x 85' long Autoclave with hydraulically operated Quick Opening Door.



**STRUTHERS WELLS CORPORATION**

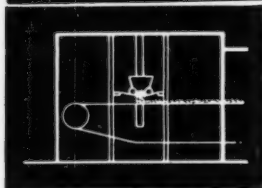
**Process Equipment Department**

PLANTS AT WARREN, PA. and TITUSVILLE, PA.  
Representatives in Principal Cities









## PROBLEM:

To increase the production of sulfa drugs to meet the market demands—yet control the quality of finished product.

## SOLUTION:

A Proctor continuous conveyor system with a rolling extruder equipped with a special grid type plate was recommended by Proctor engineers. Preforming permits air to circulate through the bed of material on the constantly moving conveyor. Accurate control was maintained, production was increased and the product met all the tests for quality.



Another processing problem solved by

## PROCTOR

## INTEGRATED ENGINEERING

This processing problem was solved only by painstaking research. Exhaustive test work done in the Proctor laboratory, in cooperation with the customer's technicians, netted conclusive results that were projected into full scale operation. So accurate was this work that the performance of the drying system was guaranteed in the sales contract and the dryer was designed to dovetail right into the complete processing line. This approach to a processing problem is INTEGRATED ENGINEERING AT WORK!

## By INTEGRATED ENGINEERING

we mean simply this—

1. Sales engineers are available for consultation.
2. A completely equipped experimental laboratory is available for test work at no cost or obligation.
3. Engineering background and experience in drying equipment and its relation to associated processing equipment in the range.
4. Close cooperation between Proctor engineers and the customer's technicians to bring about the solution to processing problems.



**PROCTOR &  
SCHWARTZ  
INC.**

711 TABOR ROAD  
Philadelphia 20, Pa.

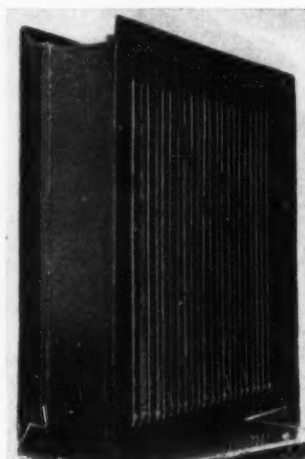


## NOW PROCTOR IS PREPARED TO ENGINEER AND MANUFACTURE RELATED EQUIPMENT

With their long background in designing and building precision drying machinery, Proctor engineers have acquired a wide knowledge of processing equipment requirements... so that today Proctor & Schwartz actually offers a complete engineering-manufacturing facility ready to help you consider not only your drying equipment needs—but a complete range of related processing equipment.

What is your processing machinery problem? Let Proctor INTEGRATED ENGINEERING help speed your solution.

## CORROSION FORUM, cont. . .



Condenser fabricated of unplasticized polyvinyl chloride.

and at the same time cause contamination of the liquid and gradual embrittlement of the polyvinyl chloride.

The great value and importance of unplasticized polyvinyl chloride has been greatly exploited in Europe, where its use in chemical construction goes back about 15 yr. Particularly during World War II, when Germany was faced with a most critical shortage of raw materials for corrosion resistant metals and alloys, unplasticized polyvinyl chloride reached the position of being a generally accepted construction material for chemical apparatus and processing equipment.

Other European countries are now following Germany rather quickly in the general use of this material, and only recently have several resin manufacturers in the U. S. started the production of resin suitable for processing without plasticizers.

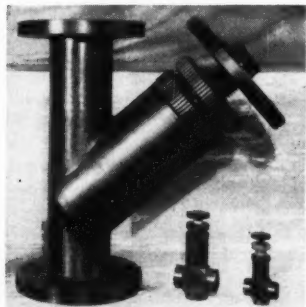
## PHYSICAL AND CHEMICAL PROPERTIES

Table I lists the physical properties of unplasticized polyvinyl chloride. The rather low value for notch impact strength may be the cause for doubt in the mind of some construction engineers. It should be pointed out, though, that the purpose of an impact strength test is not the determination of absolute values, since test conditions can never exactly duplicate actual operating conditions for the material in use. Rather it is a means to determine sub-par quality caused by production methods which prevent the reaching

of certain standard values established for the particular material. It is the job of the fabricator of polyvinyl chloride equipment and apparatus to take into account these particularities of the material to guarantee a properly engineered installation.

It is important to note that the charts accompanying this article of chemical resistances can serve as a basic guide only, since the values given cannot necessarily be applied to all operating conditions. In certain instances, therefore, it is advisable to carry out additional tests for this purpose.

With regard to the chemical resistance of polyvinyl chloride, the main form of corrosive attack consists in the penetration of the corrosive liquid or gas into the interior of the material rather than a chemical reaction with the surface. Polyvinyl chloride, like most other plastic materials, will show a weight increase rather than the loss of weight experienced by metals undergoing corrosion, and this weight increase is directly connected with a volume increase called swelling. Unplasticized polyvinyl chloride offers exceptional resistance against corrosive media, which in many cases surpasses that of high grade steels and non-ferrous metals. This excellent resistance is due to the fact that swelling caused by aqueous reagents is low, and because a chemical reaction between polyvinyl chloride and corrosive media takes place only in a very few border cases. It must be pointed out though, that certain organic solvents will bring about considerable swelling. With respect to the effect of water and aqueous solutions on polyvinyl chloride, it should be noted that the swelling and the ensuing weakening of the material intensify at temperatures higher than 140 deg. F. and may lead to crack and



Polyvinyl chloride valves ranging from  $\frac{1}{2}$  in. to 6 in.

## SPECIALISTS in PIPE FABRICATING

Butt Welds • Bending All Types • Coiling  
Machining • Threading • Beveling • Lining  
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PIPE—Wrought Iron—Steel • Structural Cast Iron  
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PILING—Sheet piling, lightweight  
—Tubular—all size.

PILE FITTINGS—All  
types and sizes  
for steel and  
wood.

For Oil,  
Chemical, Con-  
crete, Asphalt  
and other Indus-  
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## SILICATE SERVICE FOR CHEMICAL BUYERS

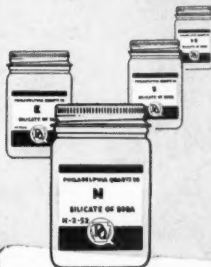
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Besides, let us send you the silicates best suited to your process. Selections are from a group of 40 products ( $3\text{Na}_2\text{O} \cdot 2\text{SiO}_2$  to  $\text{Na}_2\text{O} \cdot 3.75\text{SiO}_2$ ) for use as adhesives, binders, sizes, gels, sols, detergents, deflocculants, coatings, films, flocculating agents.

Clip coupon to your letterhead for free bulletin on PQ Silicates and their industrial uses.

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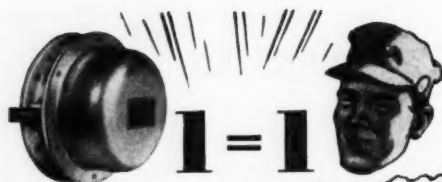
**PQ Silicates of Soda**  
METSO DETERGENTS



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Name \_\_\_\_\_  
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"We have used your Bin-Dicators in our fertilizer plant for some time and would not be without them. I can show you a case where a single Bin-Dicator replaces a man," writes a New England manufacturer.

## BIN-DICATOR

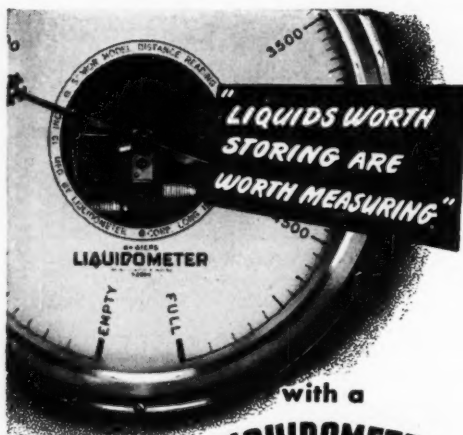
"keeps an eye" on levels of bulk materials in silos, hoppers, bins, chutes and automatically reports to central control point. Prevents over-filling; prevents overfeed and underfeed to conveyors and filling equipment; prevents delays and waste. Low cost, easy to install, simplest operation. Widely used.

**BIN-FLO** Aerator Units keep dry, finely ground materials moving in bins, hoppers, chutes; prevent packing, bridging.

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- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES

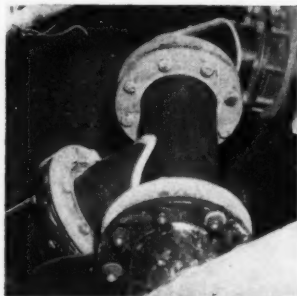
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*Tank Gauge*

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## CORROSION FORUM, cont. . .



Six-in. polyvinyl chloride pipe and fittings with steel back-up flanges.

blister formation at temperatures near 200 deg. F.

In addition to temperature, the concentration of aqueous solutions is of great importance. In this respect it can be generally stated that the damaging effect of aqueous solutions decreases with increasing concentration of such solutions.

The diminishing corrosive effect with increasing concentration applies basically to all acids, except for those strongly-oxidizing acids where, beyond a certain concentration, a chemical reaction takes place between the acid and the polyvinyl chloride.

### FABRICATING METHODS

Sheets and plates up to 1 in. thickness are produced by lamination of calendered sheets of about  $\frac{1}{8}$  in. thickness. Tubes, pipes, rods, and bars are produced by extrusion on single or multiple-screw extruders. Polyvinyl chloride requires very high molding pressures. Since it has no true melting point, and since the viscosity of the unplasticized material even at the softening temperature is very high, the use of injection molding for the manufacture of semi-finished products such as pipe-fittings, pipe flanges, etc., is not a simple matter.

Semi-finished polyvinyl chloride forms can be machined, drilled, sawed, easily with all types of hand tools and machine tools. Methods for machining light metals are applicable to the machining of unplasticized polyvinyl chloride. It is essential to provide for efficient heat removal from the tip of cutting tools or drills, since the hydrochloric acid liberated at elevated temperatures is likely to attack the surface of the tools. Finishing of sheet and plate edges can be effected by means of woodworking planes, routers, as



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Butler Buildings give you the answer *right now* . . . for plant expansion and new construction of processing, packaging or storage facilities. Butler Buildings (with galvanized or aluminum covering) go up in days instead of weeks.

Proved in use—chemical companies throughout the country benefit by using low cost, durable Butler Buildings. Pictured above is just one example—a chemical company at Military, Kansas, that uses twelve Butler Buildings to protect 15,000 tons of sacked ammonium nitrate from wind and weather.

Need plant space fast? See your Butler dealer soon or mail coupon *now!*

**Straight Sidewalls . . . Get All the Space You Pay For**

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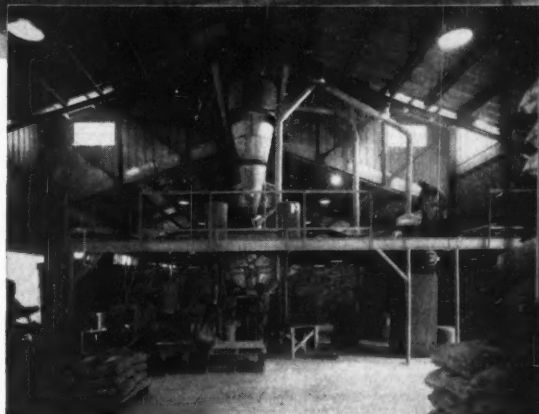
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**ADAPTABILITY** of Butler Buildings is shown here in this chemical processing plant installation at Memphis, Tennessee.



We haven't heard of any dog sleds using Ansul equipment. But if they do there is no need for concern because of the low temperatures involved. Hundreds of Ansul Dry Chemical Fire Extinguishers are protecting hazardous locations and special equipment in the far north.

Standard Ansul models are approved for operation from  $-40^{\circ}\text{F}$ . Special low temperature models are approved by Underwriters Laboratories for operation down to  $-65^{\circ}\text{F}$ . All Ansul extinguishers provide effective and dependable protection for flammable liquid, gas and electrical fires.

SEE PAGE 260

## New Type Eppenbach COLLOID MILL

Featuring

Large Tangential Outlet which prevents back pressure and allows increased output capacity. Both Rotor & Stator are interchangeable. Stellite rings and stones—facilitating replacement when required.

Sanitary fittings throughout. Illustration shows large production Mill Model QV-11 with 15 H.P. motor.

Eppenbach Colloid Mills operate at speeds approaching the theoretical minimum required for true wet micro grinding—shaft speeds up to 10,000 r.p.m. depending on size and type of mill.

These Mills assure uniform grind through advanced engineering features including (1) Improved ball bearings which center the shaft and minimize lateral whip and (2) Invar shafting with zero coefficient of heat expansion.

All Mills can be made with pressure feeds and jacketed hoppers.

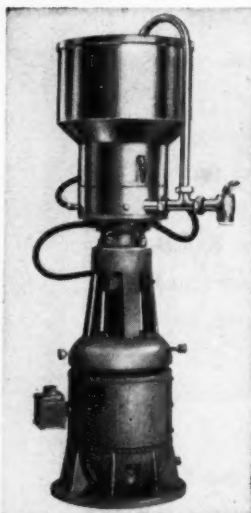
Consult our Sales Department with your technical problems.

Write for literature describing Eppenbach equipment—now manufactured and sold by:

### ADMIRAL TOOL & DIE CO., INC.

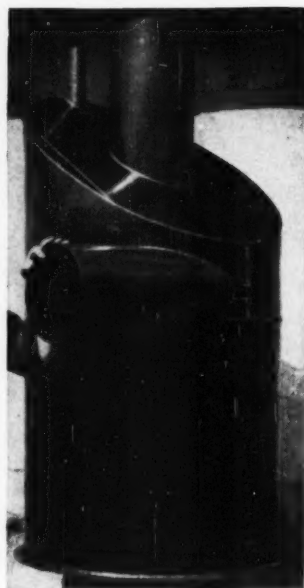
45-10 VERNON BOULEVARD  
LONG ISLAND CITY, 1,

N. Y.



Direct-drive model shown operates at 3500 RPM. Higher speeds can be furnished. Colloid Mills made in all sizes from 1/2 H.P. model laboratory size to 50 H.P. model.

CORROSION FORUM, cont. . .



Section of all-welded unplasticized polyvinyl chloride reactor tank.

well as belt and disc sanders. It is also possible to trepan sheet material for the manufacturing of discs and

One of the main advantages of synthetic materials such as polyvinyl chloride is their ability to be formable at temperatures between 130 and 150 deg. C. At these temperatures, unplasticized polyvinyl chloride shapes become soft, so that sheets and plates can be bent, tubes and pipes up to 2 in. diameter can be curved for elbows and flared for bell and spigot type joints. However, the material has a "memory," i.e. bent sections have a tendency to return to their original shape if re-heated. It is essential to keep formed parts rigidly clamped in a bending jig until they have cooled off completely. Unplasticized polyvinyl chloride in sheet form can be deep drawn in wood or metal molds under low pressure, whereby quite elaborate shapes, which otherwise would be complicated to produce, can be manufactured from sheet stock.

Generally, the methods used for the joining of metals, i.e. bolting, screwing, riveting, and welding, can be employed with thermoplastic materials. (Welding can be done only with certain materials such as polyvinyl chloride, polyvinylidene chloride, and polyethylene.)

## Physical Properties of Unplasticized Polyvinyl Chloride

### Mechanical Properties

Ultimate tensile strength	8,000-9,000 psi
Elongation	20-30%
Compressive strength	10,000-11,000 psi
Impact strength, Izod (notched)	0.5-0.8 ft.-lb./in.
Modulus of elasticity (flexure)	450,000 psi
Hardness	120 Rockwell-R
Taber abrasion resistance (No. 60 D 2R)	Weight loss at 5,000 revolutions, 0.085g.
Volume loss at 5,000 revolutions	0.060 cc.
Specific gravity	1.38-1.40

### Thermal Properties

Thermal conductivity	$2.8 \times 10^{-4}$ Btu./ft./sec./° F./in.
Coefficient of linear expansion	$4.5 \times 10^{-5}$ ° F./in.
Vicat softening point	85-90° F.
Specific heat	0.32
Flame resistance	Self-extinguishing

### Electrical Properties

Dielectric strength	1,200-1,300 v./mil (26° C.)
Dielectric constant	3.0-3.2 at 10° cpm.
Power factor	0.02
Volume resistivity	$10^{10}$ ohm/cm.

Thermoplastic materials can also be joined by cementing, which represents a considerable advantage over metals.

Due to its low impact strength and high notch sensitivity, unplasticized polyvinyl chloride is not recommended for use as screws or bolts. Should screwed or bolted joints be necessary, it is advisable to employ a thread of rounded profile to minimize the notch effect of threading.

As was stated above, unplasticized polyvinyl chloride does not have a melting point. It begins to soften at about 85 deg. C., becomes leather-like at 130 deg. C. and begins to flow at about 180 deg. C. At this point it is possible, through pressure, to produce a homogenous bond (weld) between sections of unplasticized polyvinyl chloride. Since, for obvious reasons, the use of the open flame is not permissible, new procedures for generating and transmitting of the required welding heat had to be developed.

Without question, the most important and most versatile welding method for unplasticized polyvinyl chloride sections is the hot gas welding method, the principle of which is similar to that of the oxy-acetylene welding of metals. The welding process is replaced by a stream of heated inert gas (nitrogen, carbon dioxide, air, etc.). The filler rod employed in the hot gas welding of unplasticized polyvinyl chloride is usually of identical composition as the sections to be joined, and only in special applications is it advisable to use a filler rod containing a small percentage of plasticizer to reduce the residual stresses in the deposited filler material. The filler rod is laid down into the welding joint while the hot gas stream heats simultaneously the filler rod and the parent

BALL BEARINGS position rotors exactly for less wear on bearings and timing gears

INTERCHANGEABLE ROTOR SCREWS make major overhaul simple, inexpensive—greatly reduce need (and expense) of periodic pump replacement

LOCKNUTS BEHIND TIMING GEARS facilitate repairs

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Sier-Bath External Gear & Bearing Screw Pumps for non-lubricating materials. Sier-Bath "Gearco" Pumps for lower pressures and capacities. REPRESENTATIVES IN PRINCIPAL CITIES.

New features cut maintenance requirements, provide easier servicing, longer life. Other advantages include: no metallic contact between rotors—high volumetric efficiency—only suction pressure on stuffing boxes—direct-connection up to 1800 RPM.

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Capacities 1-700 GPM; Discharge 1000 PSI for viscous liquids, 500 PSI for light oils. Horizontal or vertical construction.

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# SCREW PUMP

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Resin-Bonded Fiberglass<sup>®</sup>

## DUCT-WORK is

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**RESISTANT** to many corrosive fumes

**ECONOMICAL**, made in stock units

**VERSATILE**, may be custom-molded

**AVAILABLE**, from new larger plant

**ACCEPTED** by the chemical industry

**PROVED** in actual service

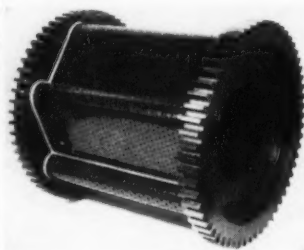
Check up on PLA-TANK for new duct jobs now on your drawing-boards -- or for replacements of existing systems.

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**THE Chemical CORPORATION**

61 Waltham Ave., Springfield 9, Mass.

CORROSION FORUM, cont. . .



Polyvinyl chloride plating barrel.

material. Deposition of multi-layer welds for heavier sections employed in larger structures is easily accomplished by the hot gas welding process.

Another welding method which is mainly applicable to the welding of circular parts is the friction welding method. In this process heat is generated by friction; for instance, a piece of pipe is rotated at high speed against a stationary part and friction at the interface generates sufficient heat for local softening of the material surface. When this has occurred, the rotating part is brought to a standstill and pressure exerted to effect the weld.

Unplasticized polyvinyl chloride can be cemented easily, but this method of joining is of importance primarily in the lining of steel, concrete, or wood tanks and vessels with unplasticized polyvinyl chloride thin sheeting and foils.

Cementing is frequently employed in connection with hot gas welding of pipe connections. Both methods of joining, i.e. welding and cementing, complement each other in such applications to achieve completely pressure-tight fits.

Constant improvement in fabricating methods and techniques and a steadily growing knowledge and experience in proper design permit today the construction of apparatus and production equipment fabricated throughout from unplasticized polyvinyl chloride.

### Integrated Mica Paint Under Development

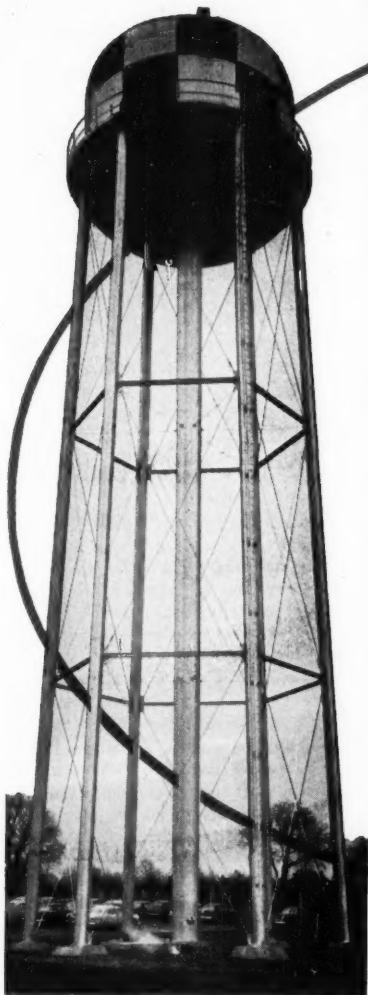
Moses D. Heyman, President, Integrated Mica Corp., Woodmere, N. Y., reports the following developments in connection with his process to protect metals with a film of mica (USP 2,568,004):

(Continued)



# POSEY IRON

## Saves Tank Buyers Money at 4 Fabrication Points

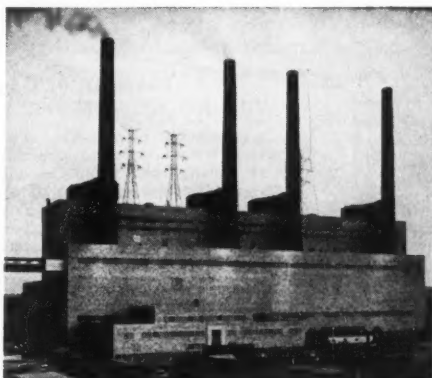


Large industries . . . and small . . . save money by consulting the Posey Iron Works at four critical points in tank fabrication:

1. *When type and size of tank are being determined.* In its forty-two years of practical experience, the Posey Iron Works has accumulated a thorough "backlog" of helpful information.
2. *When special storage problems must be solved.* Posey Iron has the facilities required to meet special requirements.
3. *When corrosive liquids must be handled.* Posey Iron engineers are well qualified to advise on the alloys needed to handle the various corrosives—including sulphuric acid.
4. *When tank is ready for erection.* Posey Iron is equipped to give complete service in erecting tanks. Posey Iron Tanks are constructed with flat, ellipsoidal or radial cone bottoms . . . with structural or tubular columns. All standard codes are met. It may pay you to check with Posey. Write today.

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- Stacks
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- Digesters
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- Pipe
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- Pressure Vessels
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- General Steel Plate Construction



Recently installed Posey Iron tank with 150,000 gallon capacity. 34' diameter; 12'6" on straight shell with ellipsoidal top and bottom.

These four Posey Iron stacks measure 23' diameter x 12'6" diameter x 192' 6" high.

## POSEY IRON WORKS, INC.

*Steel Plate Division*

LANCASTER, PA.

New York Office: Graybar Building

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# **NOW!** **Something New** **in** **MIXERS**

- For Practically  
All Materials  
and Liquids
- Relatively Inex-  
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- Almost No Main-  
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## **INSTANT, PERFECT MIXING, WITH NO MOVING PARTS**

Here is an all-new, all-purpose slurry mixer, created by National Foam System and adaptable to almost any type of material and liquid, at any temperature. Handles and instantly wets from 10 to 200 lbs. of dry material per minute, to form a completely homogeneous mixture.

The National Slurry Mixer has no moving parts, so maintenance costs are negligible. It is readily portable and relatively inexpensive. Two or more units can be manifolded for larger quantities or to handle two or more materials at once.

Send us your mixer problems; let us show you how this all-new slurry mixer can solve them, economically and completely.

# **National Foam System Inc.**

**WEST CHESTER, PA.**

## **CORROSION FORUM, cont. . .**

"We have done sufficient work on this subject to show in a general way the following:

1. Synthetic mica scrap can be integrated into a large sheet of uniform thickness.

2. This sheet can be hardened by applying heat and pressure.

3. At a temperature of about 1325 deg. C. the synthetic mica can be caused to melt and recrystallization then sets in, making the sheet impervious and bringing it back to a semi-transparent sheet.

4. The integrated synthetic sheet can be fused onto certain types of metals by applying heat and pressure.

Credit for the development of synthetic mica scrap and also much of the work done in sintering and recrystallizing should be given to the Bureau of Mines Electrotechnical Laboratory working under the direction of Dr. Robert Hatch at Norris, Tenn.

Basic theory behind this is that the interfacial energy of a mica flake that has been freshly cleaved can be retained on its surface for a certain length of time. When such flakes are applied in a wetted state to a clean surface, they will adhere to it. Cleanliness of the primary surface is important and for the most part it is necessary to apply a fresh coat of lacquer to the material to obtain this condition. Thereafter, one coat after another of activated mica flakes are applied by spraying or with a brush. When dry, these flakes will cohere to each other and make a film. However, it is necessary to fill the pores with an impregnant, which is sprayed on after the flakes are dried.

Some work on this has been done experimentally, but there have been no large scale practical applications of this material.

Primary purpose of the process is to provide a light weight and durable paint for steel structures. Work on various phases of this problem is continuing."

## **Notice . . .**

This is the twelfth in a series of chart data presentations.

Coming:

Polyesters, Dec. 1952

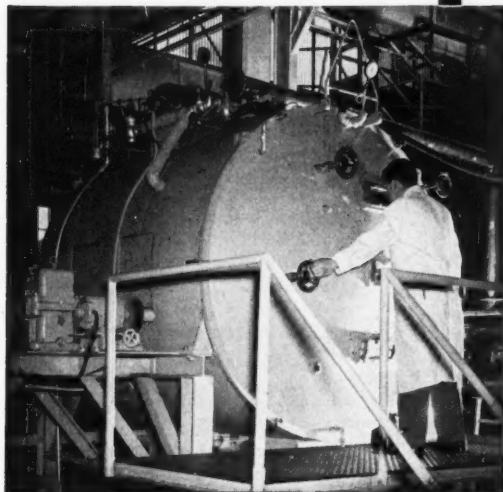
Styrene Copolymers, Jan. 1953

Lead, Feb. 1953

Worthite, March 1953

# *A Headline that is also a Helpline!*

Low-temperature drying for heat-sensitive products is performed on this sanitary type Stainless Steel Vacuum Double Drum Dryer installed in the BUFLOVAK Laboratory.



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- 2** Completely equipped with pilot plant equipment for low-temperature evaporation and drying, and other advanced processes that lead to improved operations.

- 3** Here tests can be completed, ranging from a few beakers of precious material to tank-car quantities requiring round-the-clock operation on a production scale. Results are definite! Production data is accurate! BUFLOVAK'S pre-testing has given the right answer to more than 6500 processing problems!

- 4** Many new methods, highly profitable to their users, have been developed for use in the Chemical, Food and Pharmaceutical fields.
- Your investment in BUFLOVAK equipment can be safeguarded by pre-testing your product to prove at the start whether you are on the right track to profits.

Write for complete information.

## *Buflovak Equipment*

DIVISION OF BLAW-KNOX CO.

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## Asphaltic Coatings Can Reduce Corrosion

**Currently-available are: a mineral-armored mica-filled coating which can be applied cold, waterproofing compositions, and floor coatings.**

**K. N. CUNDALL**

**American Bitumuls and Asphalt Co., San Francisco, Calif.**

American industry is now spending \$6 billion annually to combat corrosion in its plants. It is said that this industrial disease exacts millions of dollars a year from chemical and chemical processing installations alone.

However, something is being done about it. Progressive developments in the field of asphaltic protective coatings are increasing the effectiveness and applicability of such products in the chemical industry.

### SHOW GREAT PROMISE

A number of asphaltic products are showing great promise of reducing the enormous expenditures made by chemical plants to fight their No. 1 enemy—corrosion.

A mineral-armored, mica-filled coating, which is applied cold, is currently being used successfully to protect metals from oxidation in chemical processing plants. Since no heating—or heating equipment—is required to apply the material the danger from fires is eliminated and the product's cost reduced considerably. It has withstood thousands of hours of punishment in the National Carbon Arc Weatherometer without damage. These tests were made by the National

Bureau of Standards at the request of the Army. The result was a military specification covering this type of product (MIL-R-3472). This material has also met the customary tests for cracking and bonds—made by blending a coated sheet of light metal over a mandrel at 32 deg. F. The product is not intended for use on floors of chemical plants, or on wood.

An asphaltic waterproofing is being used to some extent in the chemical and chemical processing industries for exterior application and internal treatment of absorptive materials. However, in this respect, one product now would seem to stand out as superior. It is a unique type of fluid asphaltic emulsion that is used as an integral waterproofing admix for concrete and mortar. The product has been shown to have remarkable resistance to alkaline salts, bad moisture conditions, and corrosive gases. Of course, this material is to be thought of prior to construction or expansion of plant facilities, not afterward, since it is added as the concrete is mixed—at the rate of 14 gal. per sack of cement. The product has undergone extensive tests at the Pittsburgh Test-

ing Laboratories, reportedly with considerable success. The exact results of these tests are to be released in the very near future. The material was offered to the market after extensive initial tests by the University of California and Stanford University.

### PROTECTION FOR INSULATION

Asphaltic products are doing a notable job of protecting insulation in chemical processing plants. A material used to extend the life of insulation plasters, cork and Fiberglas blocks, is a homogeneous mixture of mineral fibre and fillers with a specially refined petroleum asphalt emulsified in water. No clay or similar hydrophilic colloids are used. It does not sag with heat and is completely odorless.

### FLOORS PROTECTED WITH ASPHALTIC COATINGS

Recently, a blended bituminous base product with selected fillers successfully passed a series of tests to determine its resistance to heat, wear and organic solvents. It is now being introduced for use on suitably primed floor areas and for protection of asphaltic surfaces from the effect of fuel spillage from jet aircraft.

Panels of this product were placed in a high temperature oven held at 150 deg. F. for 24 hr. Then they were pulled and inspected for evidence of deterioration, and placed back in the oven at 250 deg. F. After 24 hr. at this temperature, the material



# Dust, Grit, Fog or Fumes CAN'T GET UNDER THE "SKIN"

of your *Century*

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ENCLOSED  
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The inner frame of your Century TEFC Motor completely seals all the vital working parts against air-borne hazards. An effective stream of air blown between the inner and outer frames, keeps the motor temperature within safe limits at rated load.

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Whatever the job or working conditions, Century's wide line of types, sizes, and variety of operating characteristics, enables you to select the motor specifications for top equipment performance.

$\frac{1}{8}$  to 400 horsepower ratings — A.C. or D.C. — Furnished in Drip Proof — Splash Proof — Dust Proof — or Explosion Proof frames — for most all atmospheric surroundings.

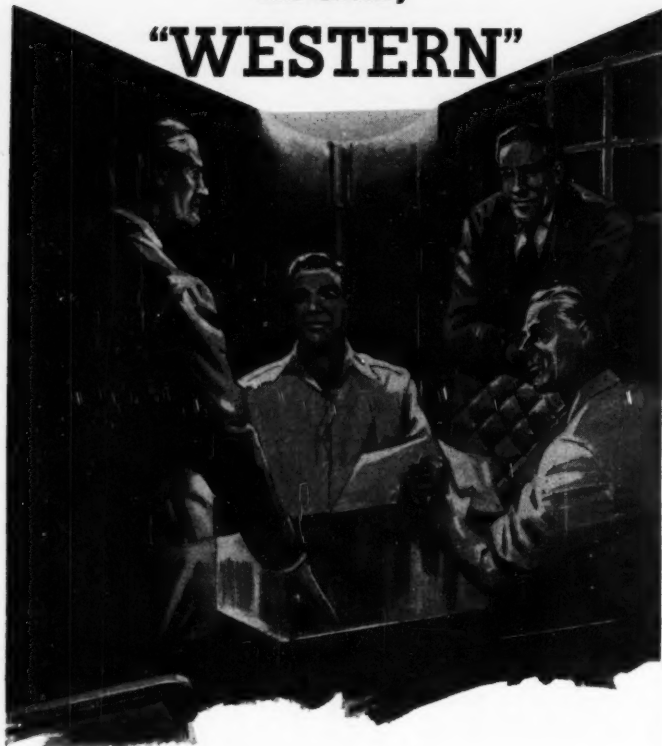
Specify Century motors on your new equipment or replacements. Your nearby Century District Sales Office or Century Distributor will be glad to give you full information.



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CE-785

# WHEN THEY SAID HEAT EXCHANGERS HE SAID, "WESTERN"



**H**e started as a salesman-engineer for a small Chemical Processing company . . . today he heads a multi-million dollar corporation. His opinion is respected not only for the position he holds, but because his climb up the ladder was built on a reputation for good judgment! In his early pioneering days he got acquainted with the people of Western Supply Company . . . found plenty of opportunity to call on their experience and advice in heat transfer problems . . . grew to have trust in the integrity of their design, construction and delivery on all heat exchanger orders.

And at that all-important plans session . . . when they said "heat exchangers" . . . he said "WESTERN".

Chapman Valves  
Taylor Fittings and Flanges  
Crane Valves  
Nordstrom Valves



CORROSION FORUM, cont. . .

showed no signs of deterioration. The panels were always allowed to cool to room temperatures before being replaced in the oven.

To ascertain the extent of its resistance to solvents, the product was spread on a 4 in. disk of hot mix asphaltic concrete,  $\frac{1}{2}$  in. thick, at a rate of  $\frac{1}{4}$  gal. per yard, using two applications. It was then cured for 96 hr. in the air at 25 deg. C. and 50 percent relative humidity. A steel ring, sealed into this film with lacquer, was filled with 10# motor oil, high test gasoline and JP-1 fuel. After standing at laboratory temperature for 48 hr., the various hydrocarbon products were poured from the ring and the area exposed to the solvent action was tested with a fire polished  $\frac{1}{4}$  in. glass rod. The film showed no signs of penetration, softening, or loss of adhesion.

This product's resistance to distilled water was well proved in the following test: A film of the material was prepared on a 6 x 6 in. tile according to ASTM Procedure D 466-42, Sec. 3. It was then cured for 96 hr. at 25 deg. C. and 50 percent relative humidity. A steel ring sealed into the specimen with the aid of lacquer cement was filled with distilled water. This was allowed to stand at laboratory temperatures for one week. At the end of this period, the water was poured out and the film examined. No blisters, loss of adhesion or other signs of disintegration were discovered.

The characteristics of this product combine to make it an important contribution to the maintenance of floors in chemical processing plants. It is applied cold with special spray equipment or by means of brooms or squeegees.

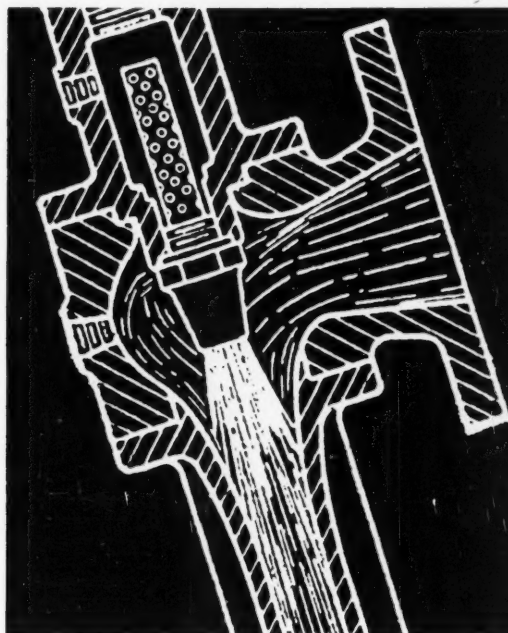
## NEW PRODUCTS—NEW USES

Mention has been made here of only a few of the many types of asphaltic coatings applicable to chemical and chemical processing plants. The development of these products indicates that many more are to come, designed to serve in every conceivable instance.

Because of its extreme durability, asphalt is continually finding its way into new and improved products with which we will be able to combat corrosion even more effectively.

—End





# this evactor works for "nothing"

By that we mean, of course, that Croll-Reynolds Evactors achieve vacuums up to a few microns absolute pressure, close to "nothing".

The wonder of steam-jet vacuum equipment is its extreme simplicity. There are no moving parts to repair, maintain and adjust and yet these trouble-free pumps achieve performance and efficiency levels in many processes unobtainable with mechanical pumps. They can handle large volumes of very low density vapor at high vacuum. Velocities up to 4,000 feet per second in the motivating fluid help to explain these results that are impossible with mechanical vacuum pumps.

Croll-Reynolds supplies Evactors in 1, 2, 3, 4 and 5-stage units, operating in the following pressure ranges:

- |         |   |
|---------|---|
| 1-stage | 3 inches of mercury absolute or higher    |
| 2-stage | 0.5 to 4 inches of mercury absolute       |
| 3-stage | 2 to 12 millimeters of mercury absolute   |
| 4-stage | 0.15 to 3 millimeters of mercury absolute |
| 5-stage | down to a few microns                     |

The one and two stage units are used primarily to remove non-condensables, in priming and in vapor removal. Three-stage Evactors find application in the growing field of vacuum refrigeration, and in

the chemical, food and petroleum industries. Four and five-stage units meet demanding vacuum requirements in many fields.

Many thousands of Croll-Reynolds Evactors are in operation, some of them for over 30 years. They are installed in every state of the United States and in many foreign countries. Let our technical staff help you with your vacuum problems.

#### INFORMATION NEEDED FOR QUOTATIONS

1. MINIMUM STEAM PRESSURE.
2. MAXIMUM TEMPERATURE OF CONDENSING WATER.
3. MINIMUM ABSOLUTE PRESSURE REQUIRED.
4. MAXIMUM DISCHARGE PRESSURE.
5. TYPE OF LOAD; THIS TO INCLUDE MOLECULAR WEIGHT OF GAS OR VAPORS OTHER THAN AIR AND PERCENTAGE OF EACH GAS OR VAPOR MAKING UP LOAD.
6. AMOUNT OF LOAD TO BE HANDLED PREFERABLY IN POUNDS PER HOUR.
7. TEMPERATURE OF LOAD.
8. TYPE OF CONDENSER DESIRED; BAROMETRIC OR SURFACE TYPE.
9. SPECIAL MATERIALS OF CONSTRUCTION NEEDED.

All of the above information is important for any EVACTOR with intercooler, pre-cooler or after-cooler. Items 1, 3, 4, 5, 6, 7 and 9 are important for single stage and other non-condensing EVACTORS. Blank inquiry sheets are available on request, also literature.



## CROLL-REYNOLDS CO., INC.

MAIN OFFICE: 751 GRAND CENTRAL AVENUE, WESTFIELD, NEW JERSEY  
17 JOHN STREET, NEW YORK 38, N. Y.

CHILL-FACTORS

STEAM JET EVACTORS

CONDENSING EQUIPMENT



## NO TIME FOR INTERRUPTION!

Absurd, too, to tolerate interruptions to a chemical or food process when De Laval centrifugal machines would make the process continuous. These centrifuges make most effective use of centrifugal force to get rid of unnecessary interruptions.

Hours that once were required for gravity settling or other inefficient methods of separation or clarification can now be cut to minutes or even seconds with De Laval centrifuges. If your process involves any of the following, it might pay you well to see whether De Laval centrifugal machines could speed it up:

1. The continuous separation of two liquids
2. The continuous clarification of one or two liquids
3. The continuous separation of two liquids plus the continuous removal of solids from one or both.

- Call in a De Laval engineer. His services can be very helpful.

### Why De Laval?

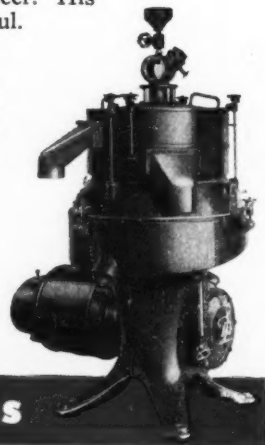
De Laval has over 70 years' experience in solving problems of separation and clarification. Your problem may be quite similar to one that has already been solved by De Laval centrifugals. It will pay you to ask.



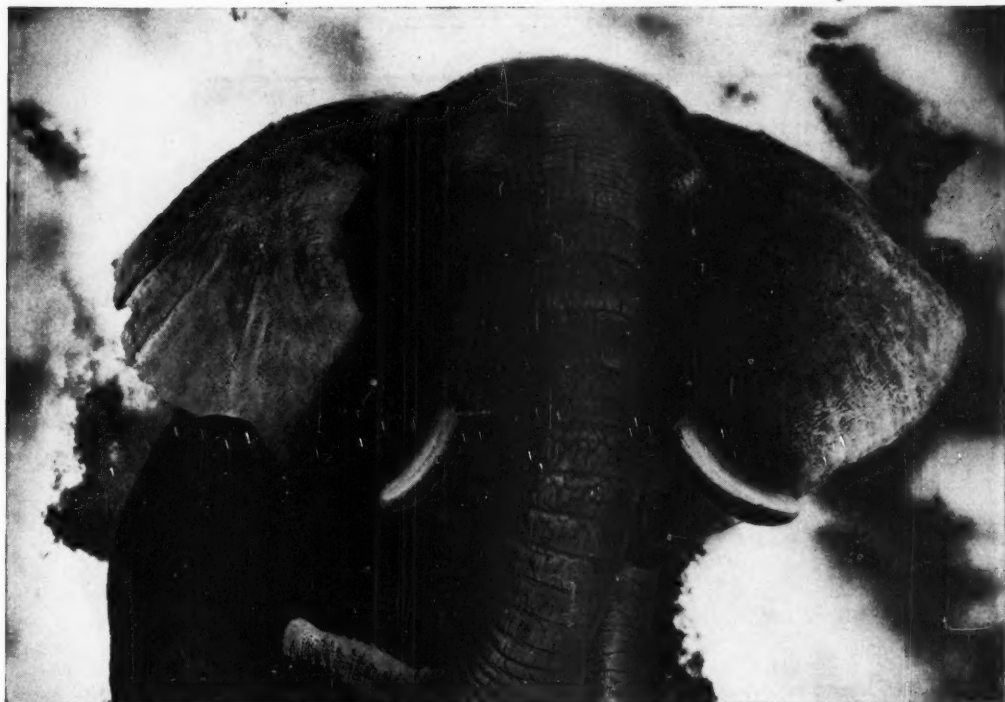
THE DE LAVAL SEPARATOR COMPANY  
Poughkeepsie, New York 427 Randolph St., Chicago 6  
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5  
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

# De Laval

**FOR FASTER PROCESSING SYSTEMS**



You can't stop an elephant with a sling shot



You can't stop corrosion with ordinary paints ...  
**it takes BITUMASTIC COATINGS!**

**CORROSION** can't be stopped by ordinary paints or conventional protective coatings . . . they can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic® Coatings can!

**FIRST** — Unlike maintenance paints, Bitumastic Protective Coatings are specially formulated from a coal-tar pitch base\* that is, for all practical purposes, impervious to water. And

when you keep moisture away from an exposed surface, you *stop* corrosion.

**SECOND** — Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements — a barrier that is impenetrable.

**THIRD** — Bitumastic Coatings provide up to 8 times the film thickness of conventional paint coatings.

**FOURTH** — Bitumastic Coatings stop corrosion caused by moisture—acid fumes — alkaline fumes — corrosive soil—salt air—heat.

\*Hi-Heat Gray contains heat-resistant metallic base.

There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.

**— SEND FOR SET OF FREE BOOKLETS! —**

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Tar Products Division  
Dept. 1159-T, Pittsburgh 19, Pa.

Please send me, without charge or obligation, your booklets on corrosion prevention.

Name.....  
Address.....  
City..... Zone..... State.....



**BITUMASTIC** PROTECTIVE COATINGS

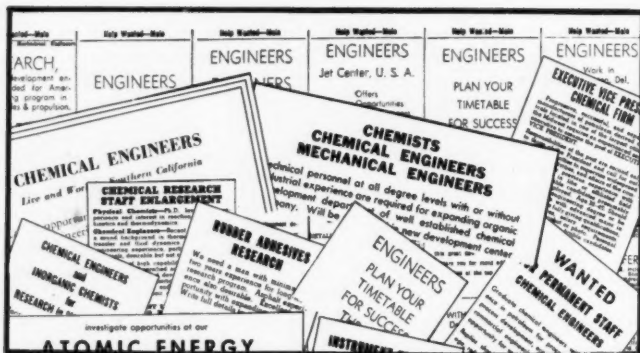
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DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

## *You and Your Job* Edited by Richard V. Reeves



### Are You in the Right Job?

- Can you tell when you're in the wrong engineering job?
- Are most engineer's job switches serious mistakes?
- Do you know the right and wrong way to quit a job?

Are you in the best possible job for your particular intellectual ability, personality and talents?

► **Change Now**—There has probably never been a better time in the history of chemical engineering to make a change—if a change is really indicated in your case.

Right now, the process industries are bigger, more diversified, and more dynamic than ever before—from the destruction of atoms to the production of zirconium. On the other hand, professional manpower is the scarcest manpower in the country today—and promises to continue that way. Today, you can work for a small company or a big one without taking a salary licking or sacrificing opportunity. You can sell, produce, do research or do almost anything else you'd like. And even these activities mean different things to different people, industries and companies.

So take your pick. But before you do, be sure: (1) that you are in the wrong job and that it's the job something's lacking in, not you; (2) that a change will be the right change; and (3) that you go about this business of changing jobs properly.

There really is no sure-fire way to tell if you and your job were made for

each other—but there are some pretty good clues.

For instance, if you suddenly became independently wealthy—solvent enough to quit working—would you still want to carry on in your present job? True, that's a silly question but its answer could provide a clue to your future.

► **Success Has One Big "If"**—There's been a great deal said about getting ahead in this business but getting ahead in your particular job or in any job boils down to one prime requirement and that requirement is that you get a "kick" out of what you do for 40 or 50 or 60 hours a week. In fact, just about every survey has proved that the man who goes up the ladder fast, who enjoys a good salary, who has a well-adjusted personal life is the man who wouldn't trade his job for any other because he genuinely enjoys what he's doing.

Recently, a nationwide survey proved that the overwhelming majority of those who had risen to executive positions in their field were doing work they got a "kick" out of. On the other side of the fence were those who could be considered in a rut. Almost half of these men considered their work "uninteresting."

► **Look for Satisfaction**—There's a lot to be said, too, for the satisfaction of contributing concretely to the products and know-how that make the world a better place to live in—in spite of the platitudes of the speech writers. So if you don't get satisfaction as well as enjoyment out of your job, something's wrong.

Of course, there are degrees of adjusting to life in general—what the psychologist calls living with reality. The happy hobo isn't necessarily well off—just well adjusted.

Incidentally, psychologists at Clark University found, recently, that the vast majority of professional men and business executives are happy in their work and find it interesting and absorbing.

At the extremes are: (1) those people who hate any kind of work and actively avoid it; and (2) the work addicts who drive themselves relentlessly. People at these extremes are likely to be in need of medical help rather than a change in activity.

► **Ask Yourself These**—If you have doubts about getting enjoyment and satisfaction out of your work, you can look for certain hints. Do you talk about your job outside the office or plant? Do you enjoy going to work

# THIS Bronze-Mounted IRON BODY VALVE

## CUTS YOUR MAINTENANCE

Only Lunkenheimer Iron Body Valves have stems made of "Stemalloy"\* — the patented bronze alloy which outwears all other stem materials three-to-one. "Stemalloy"\* stems have been tested at more than 300,000 actual openings and closings. Millions are in use . . . without a single failure.

The bronze stem never touches iron. It travels in bronze bushings which guard against corrosion and possible scoring of the stem and packing.

Notice the generous body thicknesses, non-distorting bronze disc, modern end-seated seat rings, and the bonnet bushing which permits repacking under pressure. Ask your distributor about the other advantages of the Lunkenheimer Iron Body Bronze-Mounted line.

\*Patented Alloy

WRITE FOR Circular 564, describing iron valves in detail, to The Lunkenheimer Company, Box 360P, Cincinnati 14, Ohio.

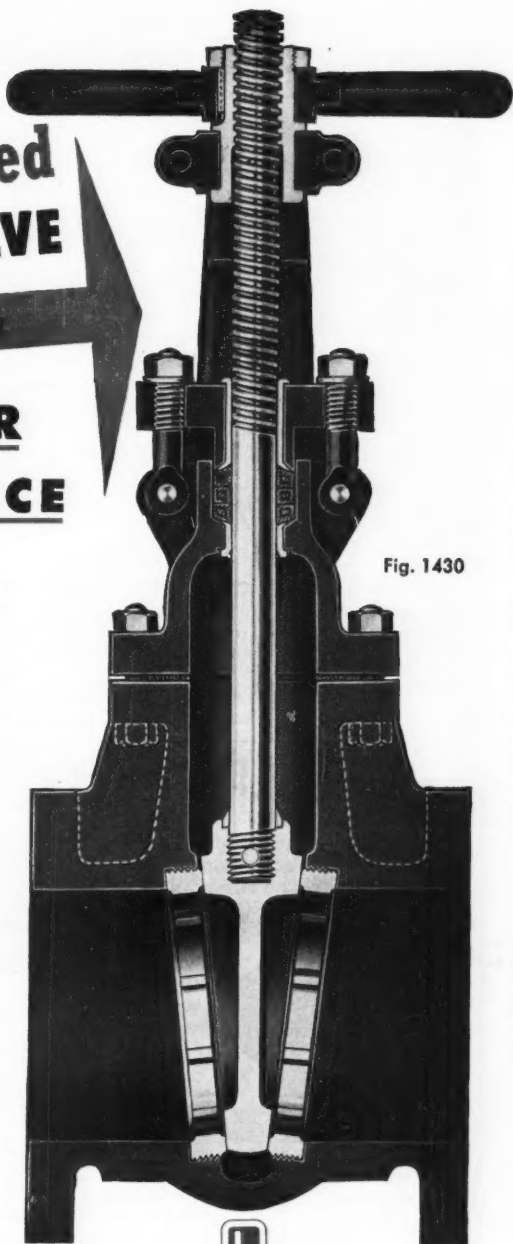


Fig. 1430



IRON • STEEL • BRONZE

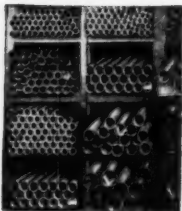
# LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-254



## STAINLESS STEEL PIPE & TUBING



from warehouse stocks

Murray warehouse stocks of stainless steel pipe and tubing are immediately available for prompt shipment in sizes from  $\frac{1}{8}$ " O.D. to 8 $\frac{1}{2}$ " O.D. Special sizes from .008" O.D. up to 48" O.D. can be supplied on order. Stainless steel pipe and tube fittings are also stocked.

Other Murray products include carbon steel tubing and pipe for mechanical and pressure purposes; boiler and condenser tubes; welding and screw type fittings. Tube bending, swaging, upsetting.

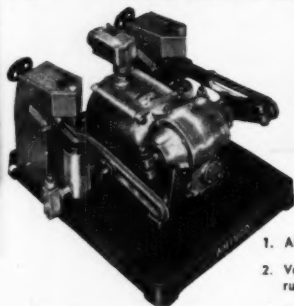


WRITE FOR CURRENT  
TUBESTOCK BULLETIN



7221

## New MICRO-FLEX CHEMICAL PROPORTIONING PUMPS



UNIQUE DESIGN  
PATENT APPLIED FOR  
OFFERS THESE  
IMPORTANT ADVANTAGES

1. All liquid in the cylinder is displaced at every stroke.
2. Variable delivery—stroke readily adjustable while pump is running. Locking nut maintains stroke adjustment.
3. Stroke adjustment indicating scale is stationary and legible while pump is running.
4. Stainless steel piston and cylinder assemblies for 7500, 15,000, and 30,000 psi working pressures are interchangeable in the same pump frame. Simplex and duplex styles.
5. Piston reciprocated by positive mechanical linkage to crank arm—does not rely on return spring.
6. Check valves removed easily for cleaning or replacement.

WRITE FOR BULLETIN 4061-D

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REACTION VESSELS  
VALVES • FITTINGS  
TUBING • PUMPS  
COMPRESSORS  
INSTRUMENTS  
DEAD-WEIGHT GAGES  
PILOT PLANTS

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*Superpressure Division*  
**AMERICAN INSTRUMENT CO., INC.**  
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## YOU AND YOUR JOB, cont. . .

each morning? Have you found new and better methods of doing your particular job? Do you do more than is expected of you? Do you know what to expect in the way of advancement in 3, 5, or 10 years? Are your ideas usually accepted—or usually turned down? Are you allowed to make most of your own decisions in your particular bailiwick or are you "spoon fed"? Do your superiors frequently ask your advice? Why did you take your present job in the first place? Higher salary? Better working conditions? Big company? Security? Answers to these and many similar questions that will occur to you may indicate that you are an eight cylinder man in a four cylinder job or, conversely, that you may need new or different challenges to bring out your latent abilities.

Well let's suppose that you are quite sure that a change is what you need. That's the time to go slow and to start applying some of that impersonal and calculating logic you learned in school.

A prominent personnel director warns that in 9 cases out of 10 a decision to change jobs is a step in the wrong direction. And practically any personnel director will agree that an engineer with a record of frequent job changes is a bad risk.

► **Look Closely.**—So if you think that you'd like to give up research and try selling or that you'd be happier making vitamins than sulphuric acid, by all means do what you prefer. But don't do it until you sit down and take stock of your assets and liabilities the way a bank does before granting you a mortgage. You'll probably find you had assets you never thought about. Or that the greener pastures across the street or across the country may be full of weeds up close.

In any case, be sure you know exactly what you're getting into, be sure you know where you want to be 10 years from now.

One more point. There's a right way and a wrong way to quit a job. There may be a temptation to "burn your bridges behind you." To "tell off" somebody you didn't like. Don't do it. It's a lot better to leave friends behind you. You may need them some day. And certainly they'll never hurt you. Besides, you're leaving any injuries behind you, so forget them.

Instead, talk your situation over with your superiors. Tell them that



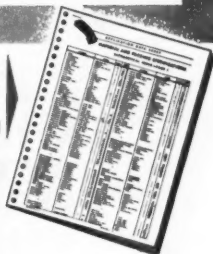
*An Invitation  
to the Chemical Industry  
from Chiksan Engineering*

**CHIKSAN** makes a  
range of ball bearing swivel joints with  
packing materials to handle practically  
all types of salts, acids, alcohols, glycols,  
aldehydes, alkaline solutions, animal  
oils, aromatics, chlorine derivatives,  
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Whether it's propane, butyl alcohol, vegetable oils or sulphuric acid, CHIKSAN loading racks with ball bearing swivel joints can be depended upon to handle these hard to handle chemical products with ease, economy and complete safety.

Chiksan has material and packing specification sheets listing 317 chemical products with recommendations for types of joints, metal and packing material to be used.

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Application Data Sheet  
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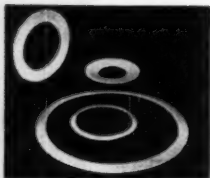
# CHEMISEAL GASKETS

ARE IMPERVIOUS TO  
ACIDS, CAUSTICS, SOLVENTS

\*Teflon's inertness to all chemicals, excepting molten sodium and fluorine, has become so well known that Chemiseal Gaskets have become standard for corrosion and contamination problems throughout industry.



Chemiseal Teflon-jacketed gaskets are available in any size, with a variety of filler materials suitable for glass, glass-lined, porcelain-lined, Carbate, Havgar or metal piping and equipment. These fillers are protected on both faces and the inside diameter by the chemical resistant Teflon jacket.



Solid Teflon cut gaskets are available either as ring or full face gaskets for all standard pipe sizes or for irregular shaped openings. Solid Teflon gaskets  $\frac{1}{8}$ " thick generally can be used wherever a  $\frac{1}{4}$ " compressed asbestos gasket would be mechanically suitable.

Sheet Teflon for cutting your own gaskets for field emergencies, is available in thicknesses from  $\frac{1}{8}$ " and in standard sheet sizes up to 36" square. Write for catalog or send blue prints for special gasket requirements.

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**FLUOROCARBON  
PRODUCTS DIVISION**  
FABRICATORS OF "TEFLON," "KEL-F" AND OTHER FLUOROCARBON PLASTICS  
CAMDEN 1, NEW JERSEY



\*DuPont's trademark for its tetrafluoroethylene resin

## YOU AND YOUR JOB, cont. . .

you're leaving—and why. And tell them before you tell anyone else.

Give notice enough to leave your work in good shape—but not so much that you'll be on the payroll with nothing to do.

Lastly, say goodbye to all of your associates. They'll be sure to wish you good luck.

And you'll probably need it.

## 5 Friction Points Between Management & Professionals

Peter F. Drucker

► **First, Not Enough Recognition**—Attitude surveys of professional employees in industry show their morale to be relatively low; they apparently know little about the businesses with which they are associated, and they complain continually about their "isolation." Also, studies of professional employee groups indicate a high degree of waste in the use of this high-grade, expensive, and scarce human resource.

Management can be blamed, if at all, only for insufficient imagination to see the problem for what it is. Actually the underlying difficulty is the difference in attitudes between professional people and the rest of the business organization.

For example, it is the essence of "professionalism" to apply objective standards of craftsmanship and accomplishment to one's work, rather than business criteria. Unfortunately, however, the professional man's attitude—his objectivity, his standards, his refusal to accept uncritically management's idea of what the result should be—is at such variance with the managerial attitude that at times the two appear almost irreconcilable.

The problem is one of basic attitudes. And the task is not to change the professional employee's attitudes; indeed, most of whatever changing has to be done will be in traditional business habits and practices. The real task is to find how to use the professional employee effectively as a professional.

What are some of the other areas in which management rubs professionals the wrong way?

► **Second, the Professional Doesn't Fit Molds**—Deeply ingrained working habits of the professional man are another sensitive point. He has been trained

—and rightly so—to work on his own. He does not, as a rule, take kindly to modern organization—especially large scale organization. He may be willing, indeed eager, to be a specialist and to leave all but his specialty to others. But in his own field he is apt to insist on having complete control of the entire job.

► **Third, He's Hard to Integrate**—The administrative process, too, is a major point of friction. Professional employees do not fit into the administrative process—and the administrative process does not fit them. By and large, the better a man is in his profession, the poorer an administrator he is likely to be. However, promotions to administrative positions are the only ones as a rule that business has in its power to give. This means that the promotion in a professional work group is likely to go to a man for whose professional abilities his fellow workers have little respect.

► **Fourth, He's Hard to Promote**—Closely tied in with the professional employee's attitude toward the administrative process is his dissatisfaction with the lack of professional recognition. In every professional-employee work group, there are men who enjoy the greatest respect on the part of their fellow workers—but who prefer to work by themselves. To promote such a man to a position of command means destroying both him and the job. Not to promote him to a position of recognition and authority, however, will breed real discontent throughout the entire group.

► **Fifth, He Doesn't Fit Personnel Practices**—A final point of friction is the matter of personnel administration. If there is one positive conclusion to be drawn from working with professional employees, it is that personnel administration, with all its policies, techniques and procedures, must not be applied to the professional group. The professional employee regards their imposition as the very antithesis of professional status; and there is nothing that he resents more deeply. Conversely, nothing appeals so much to his idea of the status due him as does direct responsibility to work out for himself the personnel practices and procedures that concern him and his group. That business today imposes personnel practices on him is perhaps his greatest grievance.

From an article by Peter F. Drucker in the Harvard Business Review for May-June, 1952. Reprinted with permission of the publisher.

## BASIC FACTS, MAN-MADE MINERAL


B-425

# Electro-Carb (SILICON CARBIDE)

## SPECIAL REFRACTORIES

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BULLETIN  
B-749

Learn  
THE BASIC FACTS  
before deciding  
on type of  
REFRACTORIES





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144 DELAWARE AVENUE • BUFFALO 2, NEW YORK

Because certain types of refractories have been used a long time IS a valid reason for investigating Electro-Carb at this time.

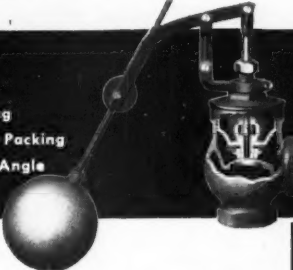
Especially so when Electro-Carb made Refractories, used for heat transfer, for example, showed a measurable 10-times increase in efficiency.

Facts and figures in almost telegraphic brevity are contained in Bulletin B-749. Sent on company-letterhead request. If you have a problem concerning the use of silicon carbide refractories, please submit it at the same time.

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For more efficient  
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- Pilot Stem
- Single Seat
- Tight Closing
- No Internal Packing
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The complete line of Davis Float Valves offers a wide variety of units for almost any given service. These valves are simple in construction, rugged in service, and accurate in operation. You get efficient control with low overall expense. Davis float valves require less maintenance, preventing costly shutdowns. Let us give you complete service recommendations. Write today!

Send for your copy of Bulletin 101-B featuring Balanced Valves, Pilot Valves, Float Valves and Motor Valves



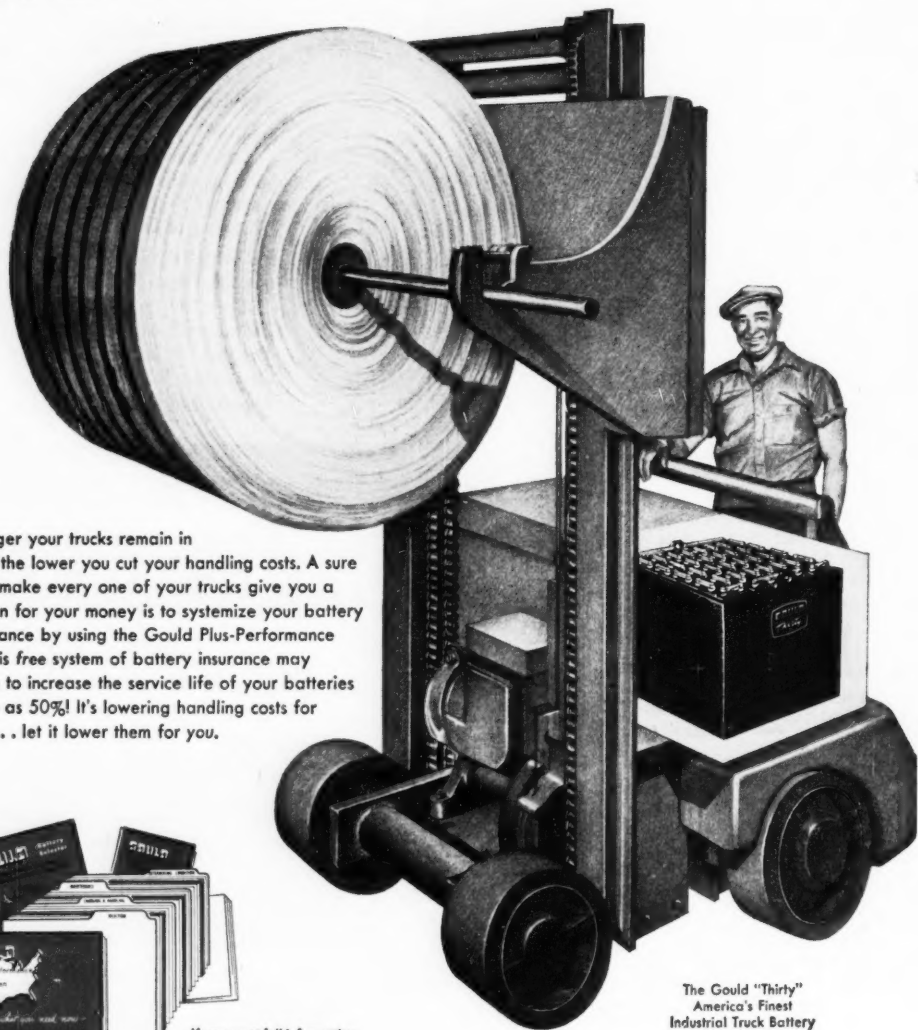
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America's Finest  
Industrial Truck Battery

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# Make These **4-WAY** **SALT SAVINGS**

yours with the help of International Salt Company's Industrial Engineers

- 1. SAVINGS ON STORAGE** by engineering the most efficient and compact salt storage system to fit your situation.
- 2. SAVINGS IN LABOR** by reducing effort and supervision involved in salt or brine handling.
- 3. SAVINGS ON WASTE** through accurate salt measurement and ending of spillage and spoilage.
- 4. SAVINGS IN USE.** Research and field work with hundreds of industries in many fields equip International to show you how best to use salt in product processing—and for product improvement, too.



No matter what type of salt your company uses, you will find it profitable to consult with International Salt Company's Industrial Division.

As part of International's service to industry, this experienced organization will acquaint you with latest advances in salt use in your field. And can advise you on all aspects of salt storage and handling, brine making, and salt and brine uses.

Here you'll find four ways to save money—and very probably, *important* money.

## Qualified on all Counts

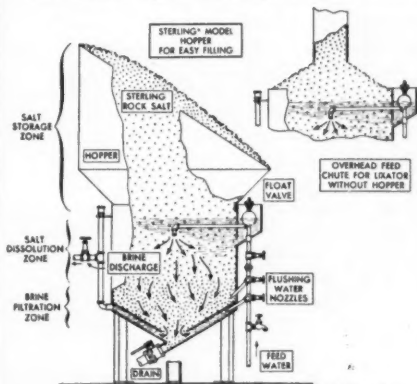
International Salt Company's Industrial Division is endowed with the experience of one of America's largest salt producers. This company produces all types of salt and operates from strategically located mines and refineries.

As supplier to all industry, it is constantly in touch with salt developments in all fields. Many such developments, in fact, have been pioneered by International Salt Company.

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No handling or attention is required beyond the hopper-loading stage—gravity does all the work. The Lixate Process is adaptable to almost numberless industrial requirements, large or small.

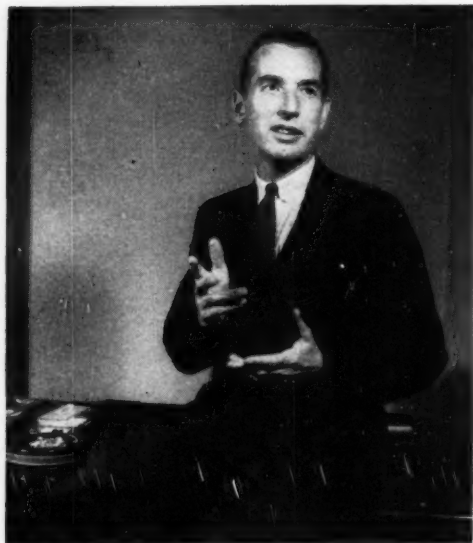


\* Reg. U. S. Pat. Off.

## INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.

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**MAN OF THE MONTH: Crawford H. Greenewalt**

**Du Pont's president is this year's winner of the Chemical Industry Medal of the American Section of the Society of Chemical Industry.**

For more than a quarter century at Du Pont, Crawford H. Greenewalt has been taking on with apparent relish some of the most complex problems the chemical industry has to offer. Today as company president, he continues to demonstrate his easy way with tough assignments.

Latest tribute to the success he makes of these assignments is the 1952 Chemical Industry Medal in recognition of conspicuous services to applied chemistry.

Among his most spectacular successes have been his key roles in making possible mass production of (1) nylon and (2) plutonium for the A-bomb. In the five years prior to nylon's commercial debut in 1939, Greenewalt's work counted heavily, especially in the scaling up of the laboratory synthesis to the pilot plant stage.

When Du Pont took on the A-bomb project in 1942, Greenewalt got the ticklish job of liaison man between the company and the University of Chicago. His vital service was to make a one-team effort out of a situation that could have easily bogged down into production men vs. atomic scientists.

The magic factor in his makeup seems to be the unusual balance he strikes between diligence and sociability. On the one hand he displays a taste for the difficult and addresses himself to his work with fierce concentration. Yet he likes people, is affable and easy to know and refuses to fret about his work outside the office.

His career at Du Pont has included important posts in four of its ten manufacturing departments and in two of the auxiliary departments. He joined the company in 1922 having just received his chemical engineering degree from MIT. Two years later he transferred to the chemical department at the company's Wilmington experiment station. In 1927 he was made a group leader and in 1933 research supervisor in charge of a number of groups. In 1939, following his work on nylon, he became assistant director of the experiment station. In 1942 he was elected a director of the company and also became chemical director of Grasselli Chemicals Dept. Then came his stint with the atomic energy program. By 1946 he was a vice president and member of the executive committee and in 1948 he was elected company president.

Although the press of recent work has pushed them into the background, his recreational interests range from orchid growing, to making model steam and gasoline engines, to photographing birds. He used to play the clarinet, cello and piano and is still deeply interested in music. So it seems that his mind, used to complex managerial problems, even demands a measure of complexity in his hobbies.

**John F. Havener.** From acting director to director, program coordination division, NPA. Began his government career in 1940 on the staff of the Bituminous Coal Consumers Counsel, Dept. of the Interior. During World War II, chief of the fuel branch of the Office of Civilian Requirements, WPB. In 1945, named U. S. Secretary of the WPB's United States-United Kingdom-Canadian combined coal committee. Studied at the University of West Virginia and Carnegie Tech.

**Ely Balgley.** Transferred to the market development department, Hey-

den Chemical Corp., and assigned to the promotion of new products. Formerly in charge of applications research.

**Howard O. McMahon.** Recipient of the Frank Forrest Award for 1952 presented by the American Ceramic Society. Science director of Arthur D. Little, Inc., Cambridge, Mass.

**Wayne T. Barrett.** Manager of the research department of the research and development division, Davison Chemical Corp. With the company since 1950. Formerly with Phillips Petroleum Co. and Mellon Insti-

tute. Doctorate from the University of Pittsburgh.

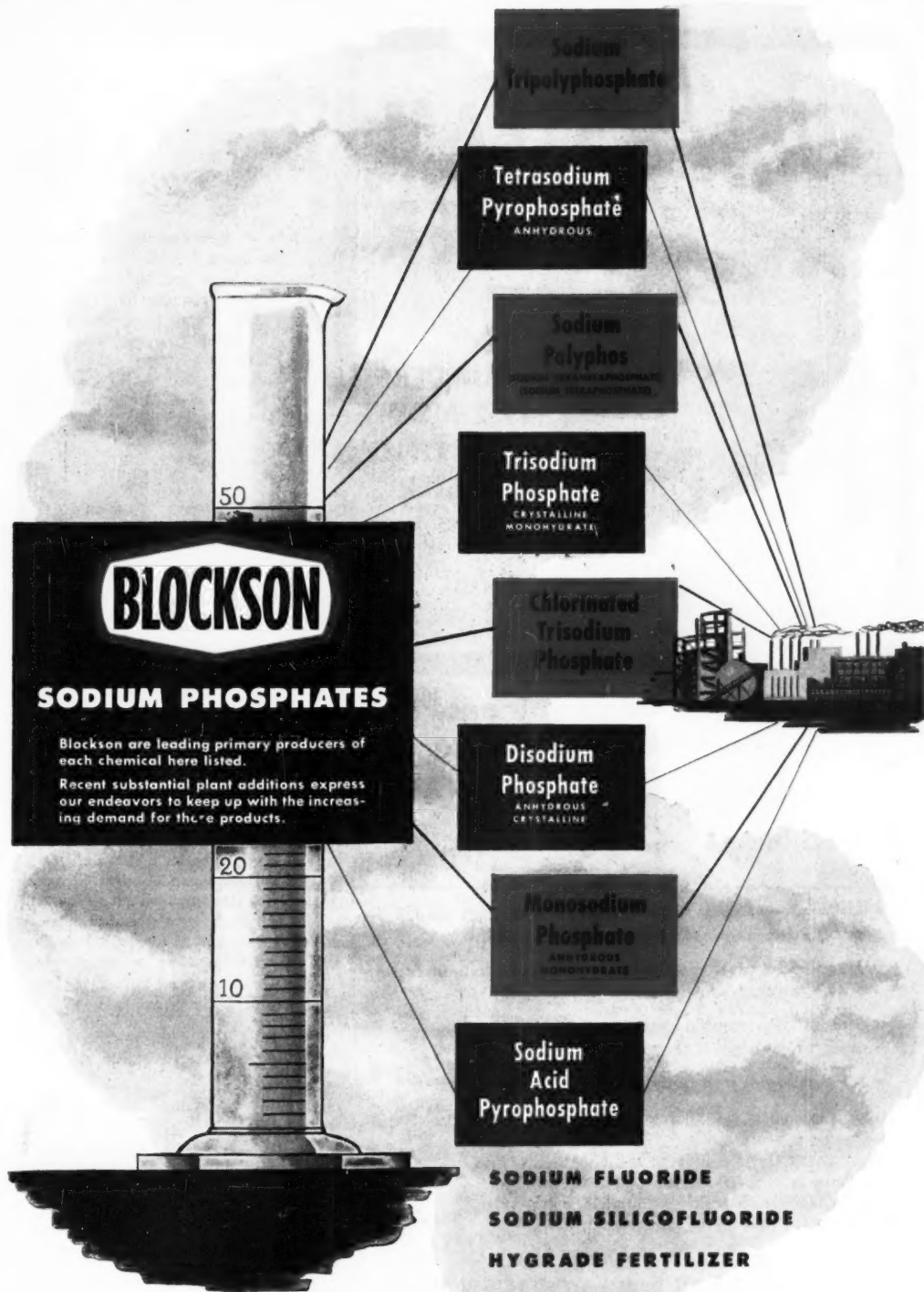


Wayne T. Barrett



K. A. Earhart

**Kenneth A. Earhart.** Manufacturing manager, coating resins department of the Plaskon Division of Libbey.



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#### NAMES IN THE NEWS, cont. . .

Owens-Ford. Comes to Plaskon after 13 years with USI where he was director of resin research from 1942 to 1951 and assistant coordinator of resin technical development from 1951 until his resignation.

**John F. Remensnyder.** Chairman of the board, Heyden Chemical Corp. Has been president since 1950. With the company for 32 years. His successor as president: **Simon Askin** who has served as vice president in charge of industrial relations and purchasing and a director of Heyden since 1948. With the company since 1943.



J. P. Remensnyder



Simon Askin

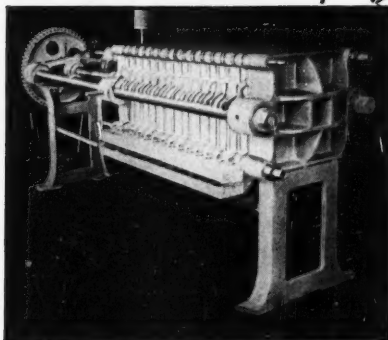
**Wilson S. Brubaker.** Senior research physicist, Consolidated Engineering Corp., New York. For the past nine years, section manager, physics department, Westinghouse Electric Corp., in East Pittsburgh.

**C. M. Blair.** Superintendent of the new chemicals and plastic resins plant to be built at Seadrift, Tex., by Carbide and Carbon Chemicals Co. Has been assistant superintendent in charge of chemical manufacturing and the technical development laboratory at the company's Texas City plant since 1941. Began with Carbide and Carbon in the research laboratory at South Charleston, W. Va., in 1934. Doctorate from the University of Texas.

**John V. Schweppe.** Production superintendent at the Shelbyville, Indiana fiber glass producing plant of Pittsburgh Plate Glass Co. With the company since 1946 as supervisor in the tank department at its Creighton, Pa., plant. Studied chemistry at Washington and Jefferson College.

**T. J. Kinsella.** From executive vice president to president, Barrett Di-

*it's a tradition*



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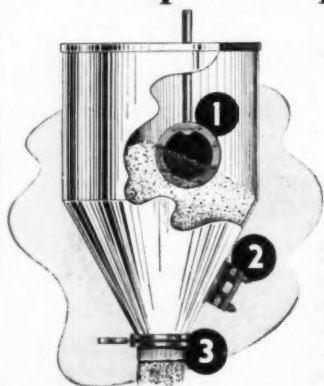
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## NAMES IN THE NEWS, cont.

vision, Allied Chemical & Dye Corp. With the company since 1947. From 1941 to 1947, price executive of the industrial machinery branch, OPA, as well as OPA representative on the War Procurement Policy Board.

**Willard M. Bright.** Assistant research director, Lever Bros. Co. Formerly director of the Theodore Clark Laboratory of the Kendall Co. With Kendall since 1942. Studied at the University of Toledo and Harvard.



Willard M. Bright



John J. Pritchett

**John J. Pritchett.** Associate director of chemical research, Hilton-Davis Chemical Co. Previously associated with Hilton-Davis from 1937 to 1948. Has also been a chemist at the General Aniline Works Division and the National Aniline Division. Chemical engineering graduate of the University of Iowa.

**W. S. Munro.** Plant manager of Monsanto's Seattle plant. Since 1947 he has been chief chemical engineer of the company's western division. Joined I. F. Lauks, Inc., in 1941 as a chemical engineer and remained in this capacity when Monsanto acquired the organization in 1944.

**C. R. Sizemore.** From manager of basic operations to general plant manager in charge of Neville Island plant operations, Pittsburgh Coke & Chemical Co.

**Francois J. Olmer.** Research physical chemist, Armour Research Foundation. Has been head of special development work for Celanese in Summit, N. J.

**James D. Dean.** Retired as head of the Southern Regional Research Laboratory's cotton chemical processing division in New Orleans. Employers before joining the labo-

ratory in 1942: Sylvania Industrial Corp., Celanese, Lyman Dept. of Pacific Mills, Robertson Bleachery and Dye Works, United States Finishing Co.

**William R. Hainsworth.** Technical advisor to the executive vice president, Fluor Corp., Ltd., Los Angeles. Formerly research director and vice president in charge of engineering for Servel, Inc. Studied chemical engineering at the University of Washington, California Institute of Technology and MIT.



W. R. Hainsworth C. V. Holland

**Christian V. Holland.** Director of chemical research, Spencer Chemical Co., Kansas City, Mo. Since 1947 coordinator of manufacturing facilities for Sterling Drug, Inc. On leave for the past year serving as deputy chief of the drugs, alcohol and solvents branch of NPA and chief of its drug and cosmetics section. Previous employers: Arthur D. Little, Inc., Virginia-Carolina Chemical Corp., Freeport Sulphur Co., Merck & Co. Studied at the University of Virginia, Johns Hopkins and MIT.

**M. F. Ohman.** From production manager to assistant general manager of the Western Division of Dow Great Western.

**E. Dorrance Kelly.** Director of a new office of synthetic rubber in the Reconstruction Finance Corp. Has been director of the rubber division of NPA since 1951. Previously deputy administrator of ECA. From 1941 to 1946, deputy director of the rubber division of WPB and of its successor agency, the Civilian Production Administration.

**Emil Heuser.** Recipient of the Alexander Mitscherlich Denkmünze, a commemorative medal presented by the German Assn. of the Pulp and Paper Chemists and Engineers. Research associate emeritus of the In-

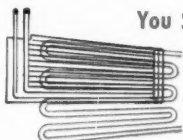
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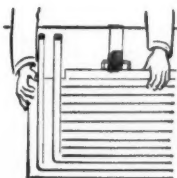
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The initial cost of stainless steel Platecoil is often 50% or more below the cost of equivalent pipe coil. Less time is required to install Platecoil with corresponding saving in installation labor.



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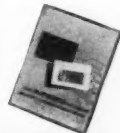
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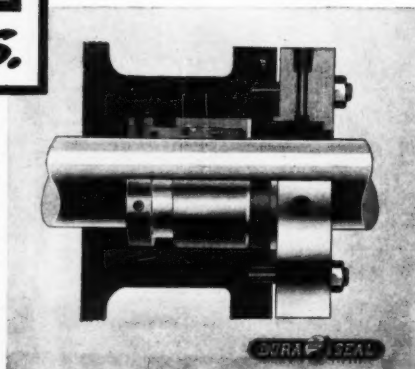
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**NAMES IN THE NEWS, cont. . .**

stitute of Paper Chemistry where he was group leader of cellulose chemistry from 1938 to 1947.



A. J. Gracia



J. A. Merrill

**Albert J. Gracia.** Manager of operations at the government's new atomic energy installation in southern Ohio to be operated by the new subsidiary of Goodyear Tire & Rubber Co., Goodyear Atomic Corp. Has been assistant manager of Goodyear research and development. Other appointments at the installation: **James A. Merrill**, from assistant manager of research with Goodyear to manager of the new laboratories; **D. H. Francis**, from manager of the government-owned, Goodyear-operated synthetic rubber plant at Houston to manager of development engineering; **George H. Reynolds**, from head of production at the company's subsidiary Pathfinder Chemical Corp. at Niagara Falls to manager of production at the southern Ohio installation.

**John V. Stauf.** On the staff of the chemical division of McKesson & Robbins, Inc. Formerly executive assistant to the president of the Solvay process division, Allied Chemical and Dye Corp. Has been with Allied for 33 years.

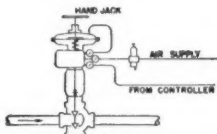
**Harry J. Collyer.** Manager of technical service, Godfrey L. Cabot, Inc., Boston. Formerly technical manager of Cabot Carbon Ltd., an English subsidiary. His successor: **Fred W. Barlow**, formerly in charge of rubber and plastics testing at the company's Boston rubber laboratory and more recently of the Texas Research and Development Laboratories.

**Amos G. Horney.** Air Force member of the National Research Council's chemistry and chemical technology division. He is chief of the office of scientific research's chemistry di-

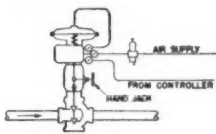
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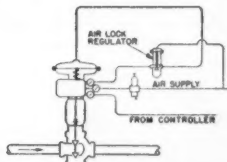
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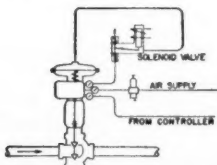
**DMV with Hand Jack Operator.** Allows for manual operation against spring action. Limits travel of valve. Example—Maximum opening in spring opened valve. Minimum closing in spring closed valve.



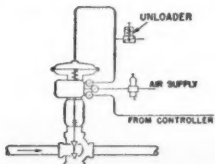
**DMV with Continuously Connected Handwheel.** Operator can open or close valve against controller action. Can operate valve manually if operating medium fails. Can set maximum opening or minimum closing of inner valve.



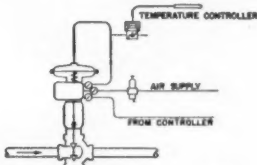
**DMV with Air Lock.** Should operating air supply fail, air lock regulator closes, locking pressure on diaphragm—valve remains at last position until operating air supply is re-established.



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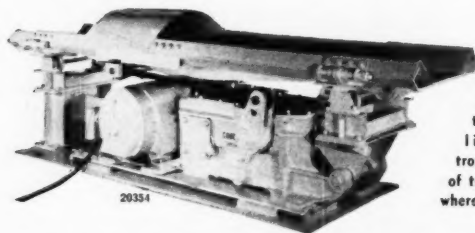
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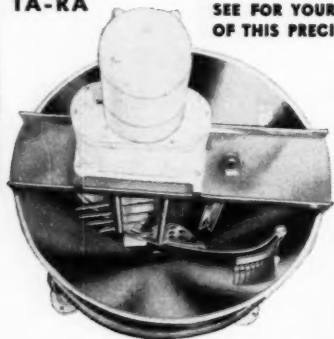
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#### NAMES IN THE NEWS, cont.

vision, Air Research and Development Command.

**F. J. Ewing.** Director, research department, Filtrol Corp., Los Angeles. Among his past positions: research chemist for the Union Oil Co.; chief chemist for the Aero-Jet Corp.; special consultant to chief of ordnance, War Dept.; atomic energy research group, North American Aviation.



F. J. Ewing



Leslie G. Jenness

**Leslie G. Jenness.** Vice president in charge of research, Kennecott Copper Corp. Joined the company in 1950 and has since supervised research activities. Doctorate in chemical engineering from Columbia.

**Hans E. Buecken.** Plant manager and product development engineer for Extruders, Inc., Hawthorne, Calif., manufacturers of plastic film and garden hose.

**John Oscarson.** Assistant technical director of General Paint Corp. with headquarters in San Francisco.

**Seaver A. Ballard.** Returned to Shell Development Co., Emeryville, Calif., from a European assignment and is now in charge of the petroleum refining department.

**James T. Wilson.** Liaison officer between DPA and AEC. Has been chief of the AEC section of NPA's special cases branch.

**H. A. Hashbarger.** New member, development department, organic chemicals division, Monsanto Chemical Co. To coordinate Kryptonium technical information developed by the various departments of the division. Since 1948, has been development manager, foreign department. Entered the company's analytical laboratory in St. Louis, 1937; to the production department, 1940, assigned to the Longhorn



Ordnance Works, Karnack, Tex., 1942; to Dayton as a member of the research team working on rocket propellants, 1943; production supervisor, Nitro, W. Va., plant, 1944. Chemical engineering graduate of the University of Illinois.

**Bernard Rabinovitch.** From instructor to assistant professor, chemistry department, Illinois Institute of Technology. Joined the faculty in 1949 as instructor in physical chemistry. Previously a post-doctoral fellow at Harvard.

**David Cornell.** New member of the chemical engineering faculty at the University of Texas.

**Bernard E. Schaar.** Recipient of the Honor Scroll awarded by the Chicago chapter of the American Institute of Chemists. President of Schaar and Co., Chicago. Studied chemical engineering at the University of Cincinnati.

**Jackson D. Leonard.** Senior associate with R. S. Aries & Associates, New York consulting engineers and economists. Previous employers: General Chemical, Du Pont, Merck.

**Joseph L. Stecher.** Retired as assistant director of sales of Du Pont's petroleum chemicals division after a 37-year career with the company. Has been connected with tetraethyl lead production and sales almost continuously since 1923, the year the first tetraethyl lead anti-knock compounds for gasoline were marketed.

**Leland A. Doan.** Assistant chief of the coal tar chemicals, dyes and intermediates branch of the chemical section of NPA. Formerly sales manager for Dow Chemical Co., San Francisco.

**Seward E. Allen.** Associate chemist, Midwest Research Institute. Formerly with the Texas Research Foundation, Renner, Tex.

**Carmen R. Giannotta.** New members of the technical service staff of M. W. Kellogg's chemical manufacturing division. Formerly supervisor of the plastics laboratory of Eastman Kodak Co.

**Milton Devore.** Process engineer with the Fluor Corp., Los Angeles. For-



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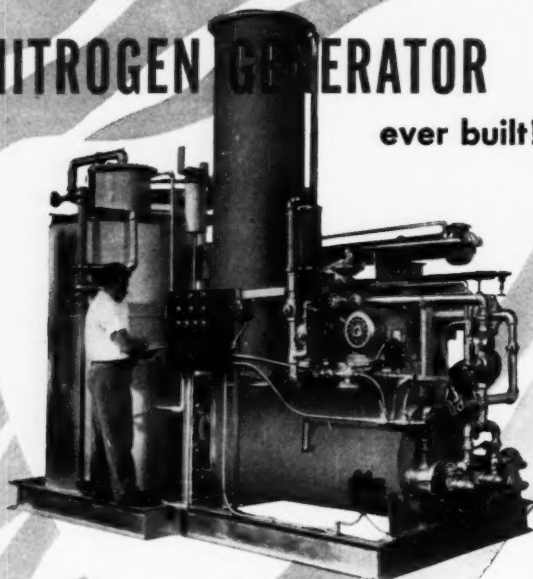
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## NAMES IN THE NEWS, cont. . .

merly research and development engineer with USI in Baltimore. Chemical engineering graduate of Cooper Union.

**Samuel S. Kistler**, Research associate, Peninsular Grinding Wheel Co., Detroit. Has been director of research for the Norton Co. and more recently dean of the University of Utah college of engineering. Doctorate in chemical engineering from Stanford.



Samuel S. Kistler



T. C. Keeling, Jr.

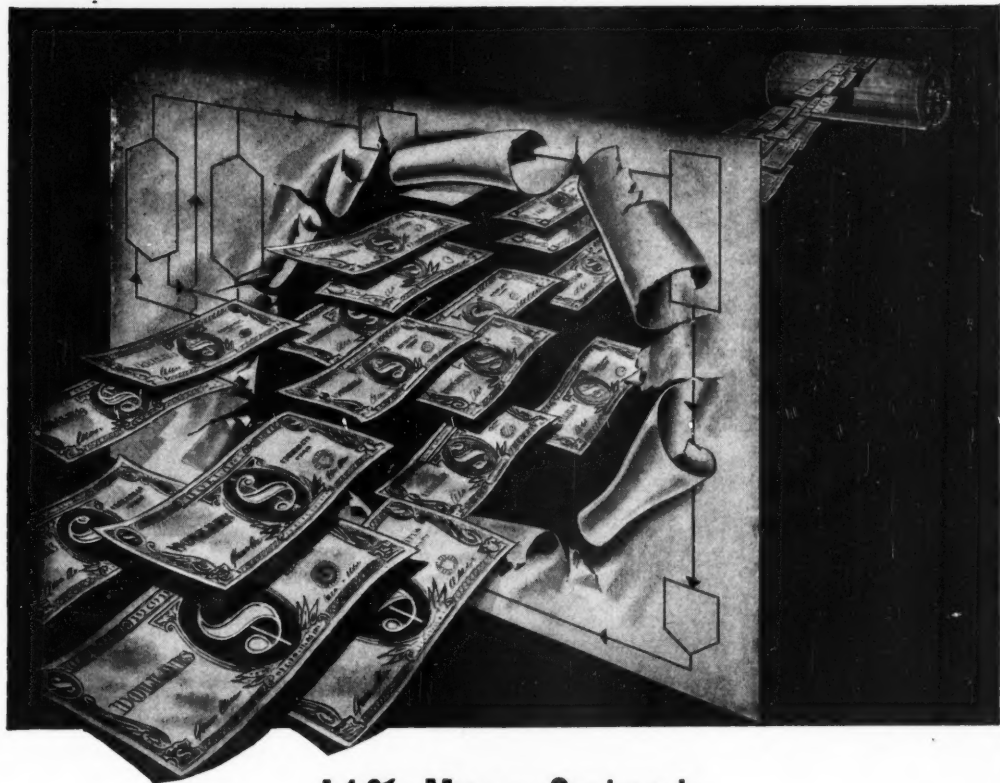
**Thomas C. Keeling, Jr.** Deputy director of the chemical division of the NPA. On leave from his position as assistant vice president and sales manager of the chemical division of Koppers Co. where he has been employed since 1945. Previously with Niagara Alkali Co. Graduate of MIT.

**William R. Millard**, With Parke Thompson Associates, Kirkwood, Mo. Formerly associate engineer at the Ames Laboratory and assistant professor of chemical engineering at Iowa State College.

**Kenneth E. Holt**, Control director, oils and meal divisions, Archer-Daniels-Midland Co. Formerly assistant research director of Anheuser Busch. Studied at Bethany and Utah State colleges.

**Elmer K. Bolton**, Honorary member, Phi Lambda Upsilon honorary chemical society. With Du Pont. Other new honorary members: George O. Curme, Jr. of Union Carbide and Carbon; E. J. Crane, editor of Chemical Abstracts; Joel H. Hildebrand of the University of California.

**Winston W. Fike**, New member of the chemical research staff of Ansco, a division of General Aniline & Film Corp., Binghamton,



## 41% More Output With Faster Safer Lukenweld Driers

Sluggish drying slowing down your output? Here's a thought that may help.

A large eastern pharmaceutical manufacturer required faster flaked drying for the production of a well-known proprietary product. By replacing two drying units using conventional type drier rolls with units utilizing Lukenweld Jacketed Steel Drier Rolls, an average production boost of 41% was realized. Had higher pressures been used, the output "bonus" would have been even more impressive. Greatly reduced maintenance costs provided still further savings. For, despite the action of 30% saline solution, the chromium plating of these drier rolls has lasted over six years.



Other type chromium plated rolls required refinishing every one and a half years.

If you have a job calling for roll drying, you can probably do it faster with Lukenweld Jacketed Steel Drier Rolls. Use of high strength rolled steel plate permits safe operation at pressures as high as 350 psi and higher. Restricting steam to a shallow annular jacket, Lukenweld design offers you faster heat-up . . . faster reflection of pressure variations . . . while installation costs are lower, maintenance minimized.

For information on Lukenweld flaking and drying and other processing machinery for the chemical field, write Lukenweld, Division of Lukens Steel Company, 400 Lukens Building, Coatesville, Pa.

Improved machinery for improved processes through engineering

# LUKENWELD

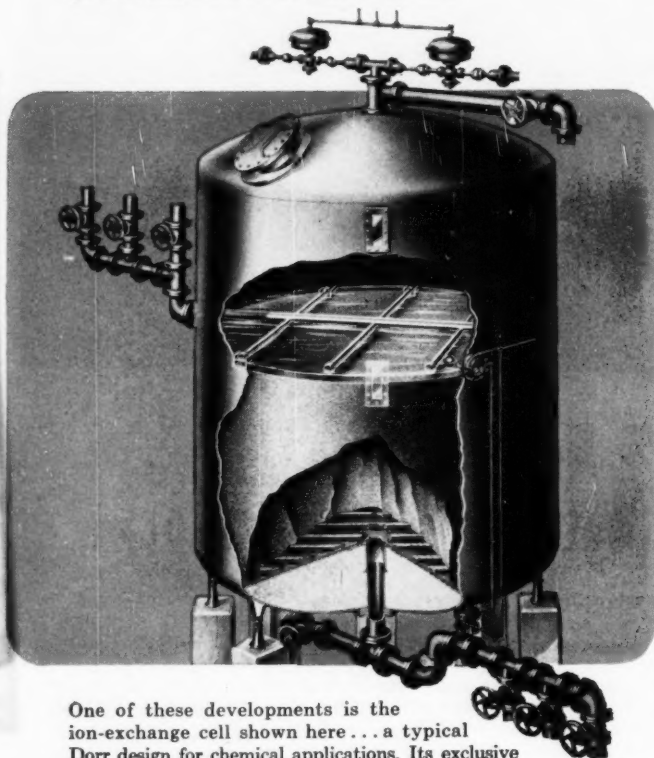
A DIVISION OF LUKENS STEEL COMPANY



# When you're thinking of ION-EXCHANGE

**make Dorr's  
experience a part of your plan—**

Equipment for the increasing use of ion-exchange techniques in the chemical process industries is being continually developed and improved by Dorr engineers. Whenever you are thinking of ion-exchange make use of our experience . . . from problem analysis to initial plant operation.



One of these developments is the ion-exchange cell shown here . . . a typical Dorr design for chemical applications. Its exclusive features provide . . .

- **Minimum dilution of solutions** treated, through use of air-dome operation with automatic level control.
- **Maximum use of cell volume** by elimination of inert supporting medium for exchange resins, through use of non-clogging under-drain distributors.



Better tools TODAY to meet tomorrow's demand

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WORLD - WIDE RESEARCH • ENGINEERING • EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.  
Offices, Associated Companies or Representatives in principal cities of the world.

## NAMES IN THE NEWS, cont. . .

N. Y. Has been assistant professor of chemistry at Thiel since 1950. Previous employers: Rensselaer Polytech, Tennessee Eastman, Winthrop Chemical. Doctorate from Rensselaer.

## OBITUARIES

**B. Smith Hopkins, Sr.**, 79, retired professor of inorganic chemistry at the University of Illinois, died August 27.

**William Speight Adams**, for many years a chemist of Sonoco Products Co., died August 30.

**Lloyd C. Billings**, 65, chief chemist of the Dallas water works, died in Dallas September 9.

**Frederick L. Curtis**, 84, retired vice president of Raybestos-Manhattan, Inc. and former general manager of the Manhattan Rubber Division, died in Passaic, N. J., September 20.

**Siegfried Fischer**, 69, consulting research chemical engineer, died in Los Angeles September 25. Earlier in his career he had been on the staff at Lehigh University and the Colorado School of Mines.

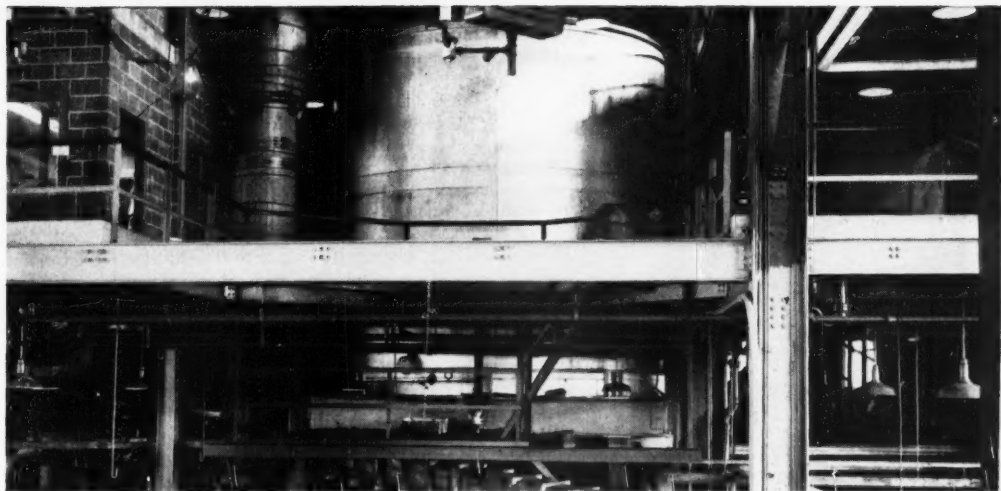
**William A. Felsing**, 61, University of Texas professor of chemistry, died in Houston October 5. He had been a member of the faculty for 35 years.

**John R. Couture**, 55, who had done plastic research for the Army Quartermaster Corps for the last four years, died October 6. Before joining the Quartermaster Corps he was chief chemist of the coated fabrics division of Atlas Powder Co. in Stamford, Conn.

**H. A. Mason**, 58, assistant manager of laboratories with the General Petroleum Corp., died October 7. He joined the company as a chemist in 1917.

**Fred H. Haggerson**, 68, chairman of the board of Union Carbide and Carbon Corp. since 1951, died in New York October 14. With the company since 1919, he had been made vice president in 1938, a director in 1941, president and a member of the executive committee in 1944.



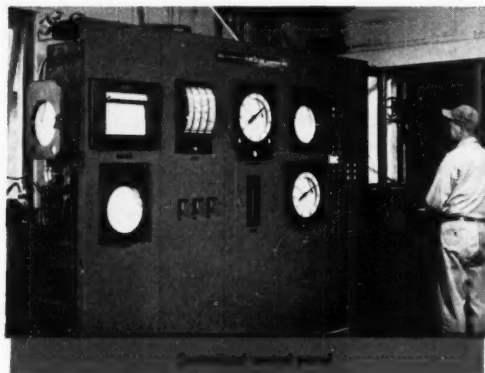


General view of Brown Company Reactor

## First Dorrco FluoSolids<sup>\*</sup> Reactor For Producing SO<sub>2</sub> Goes "On Stream" at Brown Company

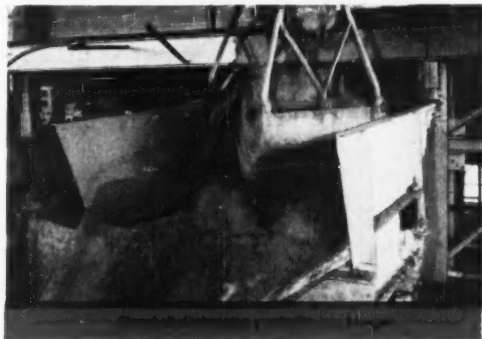
**BERLIN, N. H.** In anticipation of a continuing sulfur shortage, The Brown Company at Berlin, N. H. recently installed a Dorrco FluoSolids System to produce SO<sub>2</sub> gas from pyrrhotite. The System at the present time is supplying the entire sulfur requirements of this sulfite pulp mill . . . 11,000 tons of sulfur equivalent per year. A producer of quality pulp for high-grade photographic papers, Brown requires clean, high-strength SO<sub>2</sub> gas to make their sodium sulfite cooking liquor.

handled in slurry form. Roast is accomplished in a 16' inside diameter Reactor with the temperature automatically held at 1650°F.



### RAW MATERIAL FORMERLY A WASTE PRODUCT

The pyrrhotite, recovered from tailings of a nearby copper mine, is received in a moist condition, repulped with water to 70-75% solids, and pumped into the Reactor. By operating close to theoretical oxygen requirements, the strongest possible SO<sub>2</sub> gas is produced, with a black magnetite calcine which is quenched and



### HIGH STRENGTH SO<sub>2</sub> PRODUCED

Gas strength at the top of the Reactor averages 13% SO<sub>2</sub>. The gas then passes through a two-stage cyclone system followed by a cooling-scrubbing tower before going to the acid towers. Average chemical analysis of feed and calcine follows:

	Total Sulfur	Sulfide Sulfur	Total Fe
Pyrrhotite Feed	35.7	35.6	49.1
Combined Calcine	0.51	0.49	60.9

For detailed information about FluoSolids—a distinct departure from conventional roasters—write for Bulletin No. 7500. The Dorr Company, Stamford, Conn. or in Canada, The Dorr Company, 80 Richmond Street West, Toronto.



<sup>\*</sup> Trademark Reg. U. S. Pat. Off.

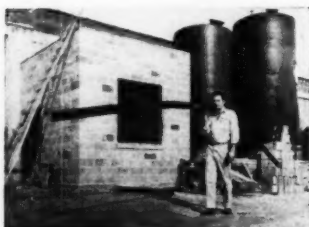


## Industrial Notes

### NEW LINES



**Heil Process Equipment Corp.**, Cleveland—Solid plastic corrosion-proof fume ducts, hoods and accessory equipment. General construction is offered in polyester glass combinations as well as rigid vinyl type and polyethylene type.



**Triangle Conduit & Cable Co.**, New Brunswick, N. J.—Semi-rigid plastic pipe (see top cut) and flexible plastic pipe (see bottom cut). The former is made of butyrate while the latter is made of polyethylene. The company is also entering the copper and brass tubing field with a new mill in New Brunswick scheduled to open in mid-1952.

**Pressed Steel Tank Co.**, Milwaukee—Stills, converters, evaporator columns, storage tanks, jacketed and agitated pressure kettles and other pressure vessels through the acquisition of Downingtown Iron Works, Downingtown, Pa.

**Cathodic Protection Service**, Houston—Graphite ground anodes for use in corrosion protection services. The new source is made available through a nationwide agreement with Great Lakes Carbon Corp.

**Ethylene Chemical Corp.**—Extruded tubing in many sizes and in machines of the company's own design.

**S. T. Johnson Co.**, Oakland, Calif.—Gas and oil fired high pressure steam boilers through the purchase of Mears-Kane-Ofeldt, Inc., Bridgeport, Pa.

**Consolidated Products Co.**, New York—Stainless steel chemical processing equipment by virtue of their new fabricating facilities.

**H. K. Porter Co.**, Pittsburgh—Forged steel fittings and hydraulic equipment through the acquisition of Watson-Stillman Co., Roselle, N. J.

**Morningstar, Nicol, Inc.**, New York—Natural gums and absorption bases through the acquisition of those departments from Innis, Speiden and Co. In the transaction, Morningstar, Nicol acquired Innis, Speiden's Jersey City plant.

### NEW REPRESENTATIVES

**Parker Appliance Co.**, Cleveland, has appointed Korhumel Steel and Aluminum Co., Indianapolis, and Ardum Supply Co., Tulsa, Okla., as distributors of industrial tube fittings and tube fabricating tools.

**Dow Chemical Co.**, Midland, Mich., has named the Emerson Co., Houston, as distributor for Styrofoam. An expanded polystyrene, the plastic is used for low temperature insulation, buoyancy and decorative purposes.

**Plexolite Sales Co.**, Los Angeles, has appointed Fiberglass Engineering and Supply Co., San Francisco, as general agent in northern California for its complete line of new translucent, shatterproof material.

**Morehouse Industries**, Los Angeles, manufacturer of specialized grinding and processing equipment for the paint, oil, ink, chemical, drug and food industries, has appointed D. B. Smith—Chemicals, as its representative in the Seattle area.

**Conoflow Corp.**, Philadelphia manufacturer of pneumatic control equipment, has appointed Bruce Greaves Co. to represent its products in the St. Louis territory.

**Eston Chemicals, Inc.**, Los Angeles, has named Hart Engineering & Sales Co. of Atlanta to represent it in the sale of its refrigerants in West Virginia, Virginia, North Carolina, South Carolina, Georgia, Alabama, Florida and parts of Tennessee and Mississippi.

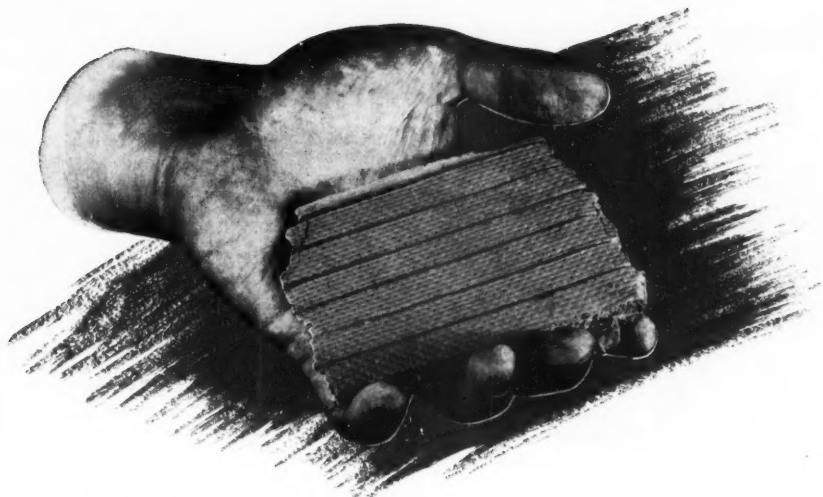
**Marion Electrical Instrument Co.**, Manchester, N. H., has appointed E. V. Roberts and Associates as sales representatives for the West Coast.

**Sterling Electric Motors, Inc.**, Los Angeles, has appointed the following new distributors: Alex Borders Machinery Co., Birmingham, Ala.; Industrial Dairy Supplies, Inc., Millville, N. J.; Prussack Electric Co., Brooklyn, N. Y.; Petro-Chemical Equipment Co., Houston; Elm Electric Supply Co., Stamford, Conn.

**Ampco Metal, Inc.**, Milwaukee, has appointed Western Oxygen Co. as an exclusive distributor of its products in the Seattle sales area.

**New York Belting and Packing Co.** has named the Rocky Mountain Machinery Co., Salt Lake City, its distributor of belting, hose, packing and other industrial rubber goods in Utah.

**C. B. Hunt & Son, Inc.**, Salem, Ohio, manufacturers of air and control valves, has appointed the following new representatives: Circle Seal Supply Co., Pasadena, Calif.; Process Equipment Co., Denver; Pollard and Co., Spokane, Wash.



## BETTER FILTRATION LEAVES its MARK

The grooves on this filter cake were made by the famous FEinc String Discharge . . . one of the big reasons why FEinc means better filtration.

The String Discharge literally *lifts* the cake right out of the weave of the filter cloth . . . carries it away in an unbroken sheet. There's no scraper to wear, smear, blind, or plug the cloth. Because compressed air is not needed to free the cake, there's no chance of blowing filtrate back into the cake.

Other FEinc features like the Compression Dewatering Mechanism or the Washing Mechanism give even cleaner cake, and better recovery of solubles.

One FEinc user saved enough with these special high-performance features to pay for his filter in three months. Another replaced four plate and frame presses with one FEinc, and reduced filtration costs 59%. Another eliminated an entire extra drying process by using more efficient FEinc filters. You can save too . . . write us today.

### BETTER FABRICS, TOO!



Our Filtration Fabrics Division is one of the leading manufacturers of long-lasting, synthetic filter fabrics. Send for free sample folder . . . today!

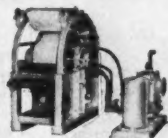
## How to Learn More About FEinc For Your Process

### 1 FREE TESTING SERVICE

At no expense to you, we'll test your slurry and send you a complete report on what FEinc filters can do for you. In your plant, without interrupting your process, or in our laboratory, with a 5-gallon sample of your slurry. Send it today!



### 2 PILOT PLANT FILTER



RENT this small but complete rotary filter. Has all FEinc features, plus interchangeable scraper discharge. No capital investment is required, and a generous part of the low monthly rental can be credited against the future purchase of any FEinc filter. Write today for details.



**FILTRATION ENGINEERS INC.**  
155 ORATON STREET • NEWARK 4, NEW JERSEY

# When better smell means better sell



Is "nose-appeal" important to your product's saleability?

Whenever it is, remember—you can satisfy the most critical buyers by using DARCO G-60 activated carbon to filter out all unwanted odors.

DARCO G-60 purifies . . . takes odors completely out . . . doesn't merely mask them or react chemically with them. It's the most effective adsorbing agent known. Research chemists have used it for years for exacting laboratory work.

You can now get this premium quality carbon in quantity—for the carload if you like—for your plant scale filtration and purification processes. And you'll probably find, as others have, that DARCO G-60 actually costs less because it filters three to four times faster . . . retains less solution . . . has higher bulk density . . . adsorbs more impurities per pound than any other carbon.

Send for complete technical data, and for a free sample of this laboratory-grade carbon.

## IMAGINUIITY AT WORK

*Production methods used in making a certain polybasic acid impart a characteristic unpleasant odor. The acid must be made odorless because it is used in the manufacture of polyester resins. DARCO treatment successfully removes the odor-bearing impurity.*

## DARCO G-60

*Highest purity . . . by the gram or carload*



## DARCO DEPARTMENT ATLAS POWDER COMPANY

Darco General Sales Office

60 East 42nd Street, New York 17, N. Y.

4 Miss. Powder Company, Canada Ltd., Montreal, Canada

## INDUSTRIAL NOTES, CONT.

### NEW FACILITIES

**Chas. Pfizer & Co., Brooklyn, N. Y.**—An Atlanta, Ga., warehouse for its bulk chemical, antibiotic and agricultural sales divisions. The building also contains regional offices for these divisions.

**Perkin-Elmer Corp., Norwalk, Conn.**—A sales and service office in New Orleans.

**Moore Products Co., Philadelphia**—A branch office in New York to be managed by J. E. Gambrell. Mr. Gambrell has been manager of the company's Detroit branch since 1945.

**J. T. Baker Chemical Co., Phillipsburg, N. J.**—New and expanded warehousing facilities and offices in Toronto, Ont.

**Arapahoe Chemicals, Inc., Boulder, Colo.**—A new office and laboratory at their plant site at Boulder.

**F. J. Stokes Machine Co., Philadelphia**—A new district office in Cincinnati headed by Theodore G. Debrecceni.

**Productol Co., Los Angeles**—A Sante Fe Springs, Calif., plant for the manufacture of 78 deg. naphthalene which the company believes to be the only such plant on the West Coast. The company's previous activity has been restricted to manufacture of cresylic acids and the separation and purification of such components as phenol, ortho cresol and metal para cresol.

**Scott Paper Co.**—A paper mill adjacent of its Soundview Division pulp mill at Everett, Wash. Construction will begin next year.

**Swift & Co.**—Modernized and expanded soybean processing facilities at Fostoria, Ohio. The plant, able to process 200 tons of beans a day, will be in operation early in 1953.

**Blaw-Knox Co.'s chemical plants** division—Expanded and reorganized Tulsa, Okla., office into a complete operating unit to be known as the western headquarters. F. Drake Parker is manager.

**Celanese Corp.** of America's chemical division—A branch office in Charlotte, N. C., headed by William Milheim.

**Godfrey L. Cabot, Inc.**, Boston—The facilities of the Georgia Pigment Co., Sandersville, Ga., which it has purchased. The latter company produces air-floated and water-washed Georgia clay.

**Cleaver-Brooks Co.**, Milwaukee distillation equipment manufacturer—A new laboratory at Waukesha, Wis., to serve its own needs and those of its subsidiary, Michael Yundt Co., manufacturers of bottle washers and pasteurizers.

#### NEW LOCATIONS

**Stein Equipment Co.** has moved its New York office to its Brooklyn, N. Y., warehouse at 107-115 8th St.

**H. W. North Co.** has moved its headquarters and all divisions of the business to 17th and Parade Sts., Erie, Pa.

**Research Co. of America** has moved to 570 Fifth Ave., New York.

**Wheelco Instruments Division**, Barber-Colman Co., has moved to Rockford, Ill.

#### NEW NAMES

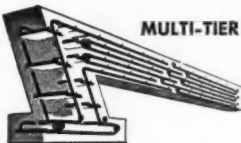
**Industrial Mineral Wool Institute** has changed its name to Industrial Mineral Fiber Institute. The association's activities have been expanding to parallel the rapidly growing uses of mineral fiber beyond thermal insulation.

**Jefferies Engineering Co.**, Westfield, N. J., has changed its name to Engineering Corp. of America. The firm specializes in designing and building special mechanical and process equipment for the chemical and petrochemical process industries.

**Reactivos S.A.**, a Mexican firm which has distributed American Cyanamid's mining chemicals since 1926, has changed its name to Cyanamid de Mexico. The firm has expanded its activities to include the entire range of Cyanamid's agricultural chemicals and textile finishes.

## CONTINUOUS PRODUCTION EQUIPMENT

*for Bakery, Confectionery, Food, Chemical and Allied Industries*



**MULTI-TIER**

Greer engineers are prepared to work with you on plant layout and to design special applications of the Greer Multi-Tier Conveyor for your particular product. Our wide experience with installations of this machine in many different industries can be invaluable in helping to convert from batch methods to continuous processing or to further simplify and streamline your present production processes. The Multi-Tier is the real answer to compact production and space-saving economy.

#### COOLING TUNNEL

As an alternate to the Multi-Tier where shorter production periods are required, the Greer Cooling Tunnel offers the most efficient answer where controlled temperatures and air circulation are a factor.

Thirty years of developing and building such equipment makes these units available in widths ranging from 16' to 52' and lengths variable by 8'. The special sectional steel belt offers a feature which provides the most efficient cooling obtainable.



**GREER J. W. GREER COMPANY**

**119 WINDSOR STREET, CAMBRIDGE 39, MASS.**



corrosion  
resistant  
cold  
headed  
products

...nails  
rivets  
screws



ESTABLISHED 1850

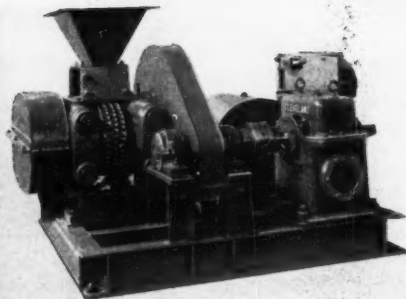
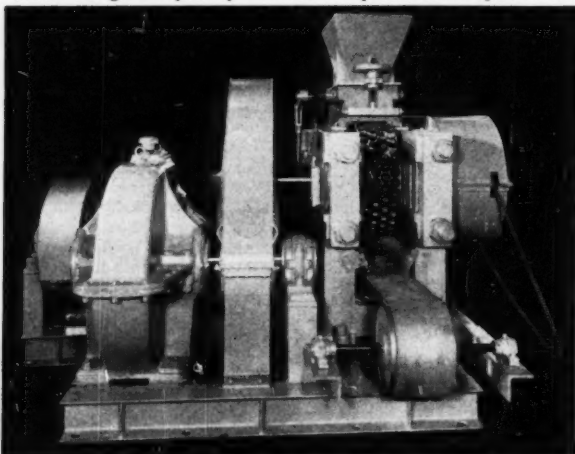
Raw material inventory of Monel, Stainless Steel, Copper and Copper Alloys on hand. Send drawing—advise quantity. Free catalog on request.

**JOHN HASSALL INC.**

144 Clay Street, Brooklyn 22, N. Y.



Below: Self-contained unit for briquetting high-carbon ferro-chrome ore. Comprises motor, speed-reducing gears, feeding and discharge mechanisms, in addition to the heat-treated alloy-steel briquetting rolls. Designed especially to meet the purchaser's requirements.



Above: Laboratory briquetting machine equipped with several sets of 12-in. diam. rolls, for making different types of briquets. Designed for use by Vulcan technicians but available to other organizations for experimental work in their own laboratories. Unit, as illustrated, is self-contained; including 5 hp. motor, speed reducer and enclosed gears for driving the briquetting rolls. Other sizes designed and built to order.

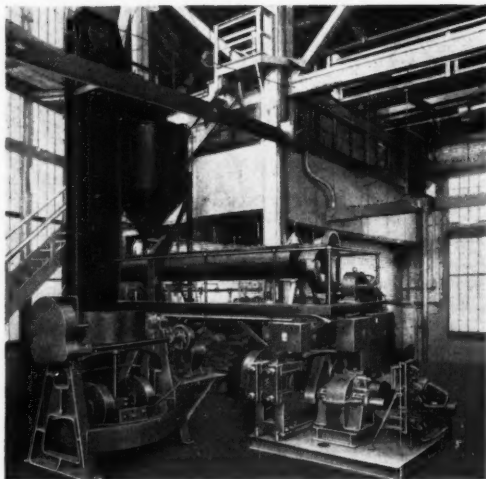
## BRIQUETTING

### MAY BE THE BEST ANSWER TO YOUR PROBLEM

For many years the Vulcan Iron Works has been designing and manufacturing heavy-duty briquetting equipment—thereby helping to solve many problems relating to the beneficiation and successful utilization of materials that were either not usable at all in their original form or could not be utilized efficiently. Materials treated range from chemicals to various types of metalliferous fines—often in combination with coal or coke and various types of binding material.

In addition to designing and building briquetting machines to meet any specific requirement we are equally prepared to design and build all necessary equipment for grinding, mixing, heating and feeding material to the briquetting machines and for carrying away the finished briquets.

Correspondence regarding any present or prospective briquetting requirement is cordially invited and arrangements will be made, if desired, for conducting either laboratory or pilot-plant tests and research.



Pilot briquetting plant in which trial runs can be conducted on a sufficiently extensive scale to determine proper commercial procedure and approximate production cost. Provided with facilities for grinding, mixing and feeding materials to the press.

## VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.**, New York Office 50 Church

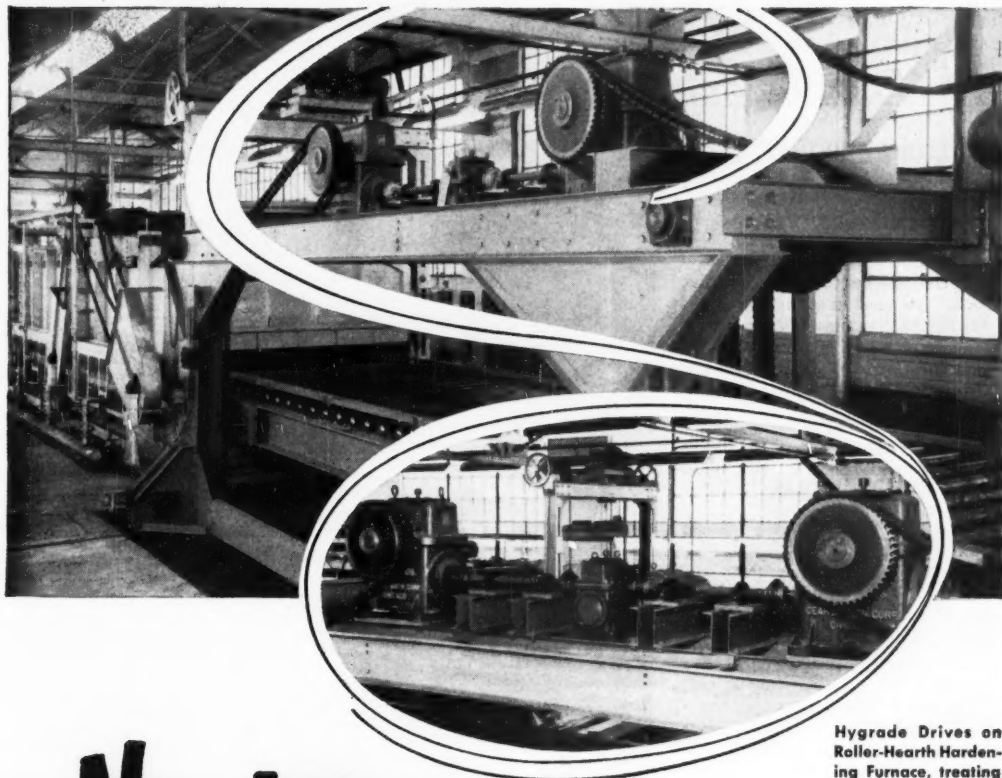
Rotary Kilns, Coolers and Dryers  
Rotary Retorts, Calciners, Etc.  
Improved Vertical Lime Kilns  
Automatic Quick-Lime Hydrators

Double-Roll Briquetting Machines  
Open-Hearth Steel Castings  
Steel-Plate Fabrication  
Shaking-Chute and Chain Conveyors

Heavy-Duty Electric Hoists  
Self-Contained Electric Hoists  
Scraper-Loading Hoists  
Cast-Steel Sheaves and Gears

Steam Locomotives  
Diesel and Gasoline Locomotives  
Diesel-Electric Locomotives  
Electric Locomotives and Larrys





Hygrade Drives on Roller-Hearth Hardening Furnace, treating Carbon Steel and Armor Plate, built by DREVER COMPANY, PHILADELPHIA.

# No JOB FOR A WEAKLING

## FOOTE BROS.

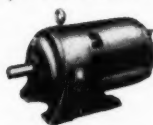
*Better Power Transmission Through Better Gears*



Maxi-Power  
Drives



Line-O-Power  
Drives



Foote Bros.-Louis Allis  
Gearmotors

Handling hot plate is no job for weaklings. This is why the Drever Company chose rugged, powerful Hygrade Drives on this Roller-Hearth Hardening Furnace. These sturdy units not only handle this tough job with ease, but with minimum maintenance.

Wherever you have a speed reduction problem where low cost and rugged dependability are essential, the Hygrade Line of Enclosed Worm Gear Drives offers a solution. Available in a wide range of ratios and h.p. capacities in horizontal and vertical types. Vertical drives are also available with wider low speed bearing span to accommodate long, unsupported output shaft extensions.

Foote Bros. Gear and Machine Corporation  
Dept. CE, 4545 South Western Boulevard  
Chicago 9, Illinois

Please send a free copy of Bulletin HGB  
on Foote Bros. Hygrade Worm Gear Drives.



Name.....  
Company.....  
Position.....  
Address.....  
City..... Zone..... State.....

## WRITING REPORTS

### . . . How Much Repetition?

"A radar operator sees the screen he is supposed to be watching less than half the time, according to wartime data. We must really receive but a fraction of the words we hear or read. Things must be said twice and thrice over to have a good chance of transmission from mind to mind." Philip M. Morse, head of the physics department, M.I.T.

## MAINTAINING VACUUMS

### . . . Tips on Welding

At a meeting of the AIChE this past summer, C. Kerby Stoddar and W. E. Mooz, National Lead Co., Titanium Division, passed on to chemical engineers some recently won knowledge on vacuum welding. They emphasized these points:

1. Most good welders are capable of producing a welded seam or joint which is both mechanically strong and leak tight.

2. For best results, weld metal should be laid across a seam continuously without applying too much weld metal, and without breaking the arc, if possible. It is particularly important not to apply too much weld metal when the welded area is to be subject to high temperature later on.

3. If a leak is detected after a weld is completed, the weld should be ground off to the base metal and a new weld made. Same applies to welds that have cracked during service.

4. You cannot apply another layer of weld metal over an original leaking weld and fix things up. Stresses are liable to be set up which will cause a new crack upon heating.

5. In all vacuum welding it is advisable to use small diameter welding rods. They will minimize the crater size and the amount of heat required.

6. Two welders, operating as a team, usually can do a better job than one welder. When the rod used by one welder becomes depleted, the second welder picks up the arc immediately so that there will be no break in the weld to later cause a leak.



In recent past: From Malaya . . .



. . . to Kobuta, Pa.

## In the Future: Bigger Doings For the Rubber Industry

- 1 Natural rubber from biological processes.
- 2 Tires in rainbow colors.
- 3 New materials of construction.
- 4 Hoses for corrosive chemicals.

With dozens of new rubbers, hundreds of new pigments, myriads of new ideas, progress in the rubber industry will exceed our wildest imagi-

nation, Research Director W. L. Semon, B. F. Goodrich, believes.

Speaking at the recent National Chemical Exposition in Chicago,



## New Resistance Thermometers Accurately Indicate and Control Low Temperatures

**TEMPERATURES FROM -100 F to +300 F** can now be accurately indicated and controlled with General Electric's new line of resistance thermometers. They indicate accurately within  $\frac{1}{2}$  of 1 per cent full scale. Any change in temperature equivalent to  $\frac{1}{10}$  of 1 per cent full scale starts immediate control action.

Normal changes in humidity or room temperature do not affect the exactness of control. Neither does a change in control voltage. Sturdy, simple construction

assures reliable operation under severe operating conditions.

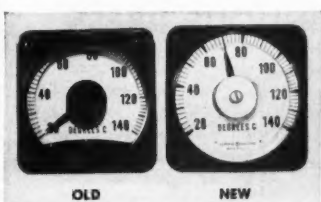
**NARROW TEMPERATURE SPANS**, as small as 90 degrees, are available anywhere in the -100 F to +300 F range. You can buy four types of resistance thermometers—indicators, protectors and two- or three-position controllers—for either flush or surface mounting.

For complete information, mail the coupon below.

## G-E Thermocouple Potentiometer Accurate Within 0.2% Full Scale

This thermocouple potentiometer measures temperature in locations inaccessible to glass-stem thermometers. Readings can be taken in rapid succession and are accurate to within  $\pm 0.2\%$  of full scale.

Typical applications include refrigerator-development work, oil-burner and air-conditioning tests, steam temperature measurements, and heat-run tests on electric equipment.



## New Shadow-proof Temperature Indicators Are Easier to Read

Temperatures from -100 F to +300 F can now be accurately indicated with General Electric's new line of resistance temperature indicators. These instruments can be read from almost any angle. The dial is set forward, flush with the front of the case. A protruding convex-type glass front provides clear illumination. No more cover overhang; no more shadows caused by overhead lighting. Two sizes available— $4\frac{3}{4}$  and  $8\frac{1}{4}$  inches. Check coupon.

## Easy to Use G-E Hand Pyrometer Available With Two Scale Ranges

Simply flick a switch to change scale ranges on General Electric's new Type FH-1 hand pyrometer. This unique feature in the new FH-1 cuts testing time, eliminates use of several pyrometers.

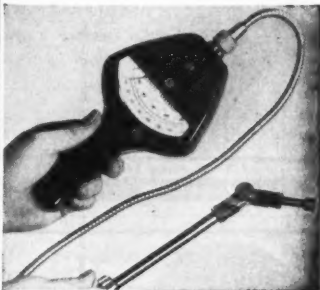
The Type FH-1 hand pyrometer is designed for rapid and convenient measurement of surface, liquid gas and molten-metal temperatures.

### THREE INTERCHANGEABLE TIPS

A surface tip, an immersion tip for liquids and molten metals, and a 2-prong contact are supplied with the FH-1. In addition, a carrying case and flexible and rigid arms are provided for the FH-1. Both tips and extension arms are interchangeable in seconds.

### AUTOMATICALLY COMPENSATED

Readings can be made directly for either scale of the instrument. With automatic cold-end compensation the FH-1 needs



no manual adjustment for variations in temperature in either the instrument or surrounding atmosphere.

See your nearest G-E representative today for complete information on the FH-1, or check coupon for GEC-836. Price of equipment shown in photo is \$118.17\*

\*Manufacturer's Suggested Retail Price

SECTION C602-242, GENERAL ELECTRIC  
SCHENECTADY 5, N. Y.

Please send me the following bulletins:  
Indicate:

- ☒ for reference only
- ☒ for planning an immediate project
- ☐ Resistance Thermometer (GEC-835)
- ☐ Thermocouple Potentiometer (GEC-245)
- ☐ Temperature Indicators (GEC-565)
- ☐ Hand Pyrometer (GEC-836)

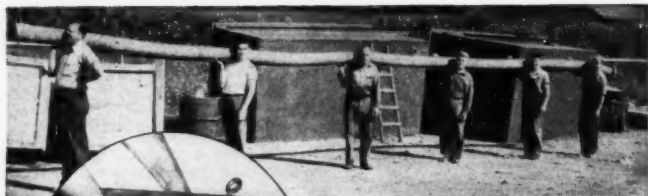
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**GENERAL  ELECTRIC**



## 6 inches in DIAMETER by 35 feet LONG

**T**HIS all-rubber hose for conveying citric acid as part of loading and unloading facilities is also subjected to rough handling. It is typical of some of the problems resolved by La Favorite Rubber Engineering.

In any situation involving protection against corrosion, erosion or abrasion in processing, conveying or storing, consult our Rubber Engineering Department. The advice of La Favorite engineers can be very helpful and may be valuable in saving substantial sums in original investment and maintenance. Consult them freely, without obligation.

Send for report #366.



*This report may stimulate your thinking on the possible savings with the use of La Favorite Rubber.*

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### DAVENPORT

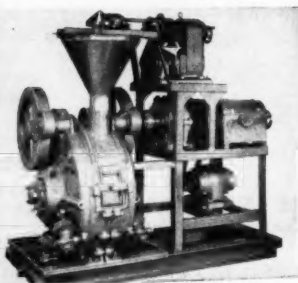
De-Watering  
Presses and  
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### ROTARY

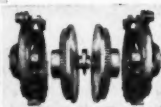
Steam Tube,  
Hot Air and  
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Dryers.

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and Air  
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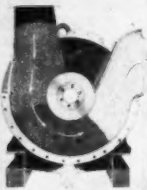
## THE "DAVENPORT" CONTINUOUS PRESS



Assembled Press



Revolving Discs



Cross Section

The Davenport Continuous Presses are made in three sizes. Davenport Presses are the most efficient mechanical method of extracting excessive moisture from semi-solids. If you have a moisture problem, let Davenport engineers assist you. Write for our complete catalog.

For quick reference see "Sweet's 1952 Processing Industries" or "Chemical Engineering Catalog, 1953."

## DAVENPORT MACHINE and FOUNDRY COMPANY

DAVENPORT 7

IOWA U.S.A.

QED, cont. . .

Semon pointed to several new developments that the industry is looking forward to.

**1** True synthesis of natural rubber is a challenge to the scientists of the world and eventually the challenge will be met. Today no one knows how the rubber tree controls so perfectly the formation of the rubber molecule, the *cis* head-to-tail polymer of isoprene for example.

It might also be possible to use biological processes to make natural rubber. Can an enzyme be separated that would permit *in vitro* growth from prepared nutrients? Or can root hairs from some rubber plant be grown in deep culture, much as we now grow penicillin?

Rubber products are currently being demanded to operate all the way from liquid air temperatures to red heat. An inorganic rubber might be an answer, although it sometimes appears that we need rather an elastomeric metal.

**2** Many improvements can be made by compounding and blending several rubbers of various properties to make a different rubber with new properties. As new rubbers are introduced, we may be able to make new and improved accelerators, vulcanizing agents, stabilizers, antioxidants, plasticizers and reinforcing pigments.

For instance, one of the vulcanizing agents used with butyl rubber, *p*-quinone dioxime, is a comparative newcomer to rubber compounding. Various new types of plasticizers developed for use with nitrile rubber were found to impart improved low temperature flexibility. Esters of dibasic acids such as azelaic are now being recommended for use in low temperature resisting rubber compounds of all types.

In addition, various pigments such as fine particle calcium carbonate or calcium silicate are finding wider use for reinforcing various rubber stocks. Fumed silica as a replacement for carbon black is being intensely worked on. A white or neutral colored reinforcing pigment of high quality would mean that tires could be made in any color.

**3** New materials of construction will pop up. Cotton and rayon cords make fine automobile tires; however the ideal fiber for use in tires has not yet been discovered.

Many new types of fibers are being



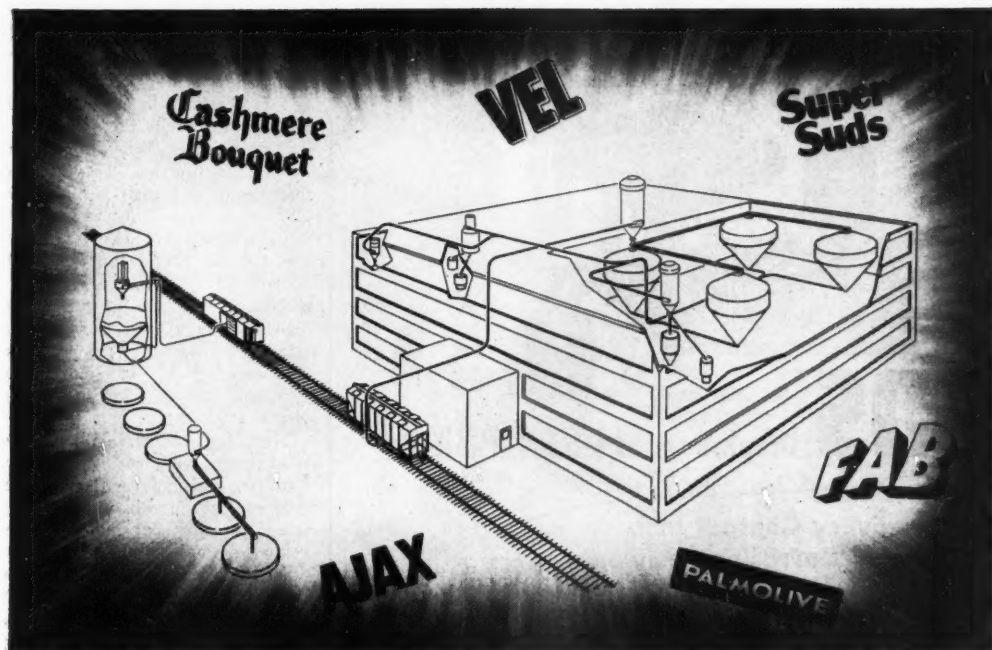


Diagram of Dracco system at Colgate's Jeffersonville plant where the "Airstream" Conveying technique has been used over 15 years. Main "in-plant" system unloads to storage (at 12½ tons/hour), withdraws from storage and transfers to production (at 5 tons/hour).

## MASS HANDLING *Cleanliness* AT COLGATE



Write Dept. C-11, Cleveland  
5, Ohio for the Dracco Air-  
stream Conveyor Bulletin 529.

At their Jeffersonville (Indiana) soap and detergent plant, the Colgate-Palmolive-Peet Company utilizes Dracco "Airstream" Conveyors extensively to simplify bulk materials handling.

Soda ash, tetra-sodium pyrophosphate and other chemicals are unloaded to storage from railroad cars by the "Airstream" system. The same system also transfers materials from storage to process equipment, thereby eliminating many manual operations and improving production economy.

Throughout the plant the Dracco materials handling equipment has been designed to integrate smoothly with Colgate's manufacturing operations. The three Dracco Receivers in the distribution system were strategically placed over the three separate production areas to discharge materials to mixing tanks by gravity. Placement of the Dracco equipment on the roof permits full utilization of all production space.

The handling flexibility and savings produced at Colgate are typical of Dracco installations throughout the process industries.

### DRACCO CORPORATION

Harvard Ave. and East 116th St. • Cleveland 5, Ohio



# DRACCO

*Performance Proved*

*Airstream* CONVEYORS • DUST CONTROL EQUIPMENT





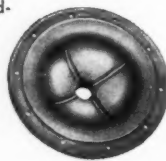
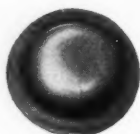
# ODS Diaphragm SLURRY PUMP

**Every Contact Inch  
Highly Corrosion Resistant**

**ODS** Pumps are available, of course, unlined for handling non-corroding slurries or solutions but when protection is necessary, all contact surfaces are lined with rubber or neoprene.

So, if you have a pumping problem that calls for a diaphragm pump—regardless of the pH involved—get all the facts about the O.D.S. Pump. It can handle just about any slurry or solution found in industry. And it has one of the best low-maintenance features to be found among all pumps: a no-linkage, hole and slot-free diaphragm. Compressed air or vacuum actuates the diaphragm.

Our Bulletin 309-R—recently issued—gives all the latest details about the O.D.S. Pump. In writing for a copy, tell us about your pumping problem. We have a line of acid-handling centrifugal pumps, too—the Olivites.



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QED, cont. . .

investigated. Nylon fabric is already in production in airplane tires and as a breaker strip to distribute shock loads on heavy duty tires.

Dacron is also being investigated for tire construction. However, no fiber known at present is suitable in all respects. Perhaps it may be necessary to change tire design in order that the new fiber perform most efficiently.

4 New designs are in the offing. Tubeless tires will gradually become standard equipment on all new cars. The smoother ride, blow-out protection and ease of repair make this merely a question of time.

New tire contours and strange tread designs will enable tires to perform new and useful services. Better mud and snow designs will give safer and more convenient automobile operation during the winter months. Special tire designs will make possible tires for use in cars operating at high speeds of 100 miles per hour or better.

Many other new designs are appearing on the market—conveyor belts to operate with red hot coke, hoses to use with corrosive chemicals and oil resistant boots. Soon to appear will be such rubber products as asphalt stabilizers, plastic bathing pools, plastic silage covers and flexible Portland cement floor coverings made with rubber and plastic latex.

## MAINTAINING FACILITIES

### ... Segregate Costs

Plant engineers or maintenance superintendents usually need more information than they get. Besides acting as a record of performance, such information could be the basis for setting up preventive maintenance programs, equipment replacements or revisions, manpower requirements, budget estimates and departmental efficiencies. But how to get this information?

Earlier this year, Plant Engineer C. E. Knight of Monsanto told the Plant Maintenance Conference at Philadelphia one way to get detailed information. He recommends, first of all, a thorough and accurate classification of costs.

Maintenance and repair costs, he says, should be segregated into four general classifications—machinery and

equipment, buildings, utilities and other services. Then costs in each of these classifications are subdivided.

Machinery and equipment maintenance expense may be segregated by equipment types, that is, motors, fans, piping, crushers. In turn, these can be subdivided into operating departments; eventually, where possible, into numbered pieces of equipment. All charges can also be separated into labor, material and overhead.

Set off costs for miscellaneous services performed by the plant engineering group from repair and maintenance costs, Knight advises. These services vary considerably in different plants, and will affect the basic maintenance cost of equipment and machinery. A tip: Maintenance of machinery and equipment in the chemical industry will vary between 8 and 15 percent per year of investment. Unless you have unusually corrosive conditions, consider 10 percent a fair estimating value. On building costs, in the New England area, 2 to 2.5 percent per year of value is normal.

"Capital additions should not be confused with maintenance costs," says Knight. Some companies replace worn or obsolete equipment with new equipment that may be capitalized. The practice can affect maintenance costs appreciably. "Capitalized replacement equipment should not be considered a part of repair costs because the question of what constitutes a replacement makes for a shadowy line, results in varying costs."

## GETTING AHEAD

### ... Popular Opinion

"Once a boy who aspired to corporation leadership went to law school; now engineering is the royal road to management. Leading engineering societies report that more than 30 percent of their members are in administrative or management posts."—Harland Manchester in *Popular Mechanics*, Oct., 1952.

## INFORMING EMPLOYEES

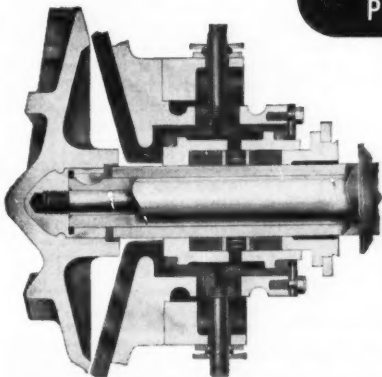
### ... A Suggestion

"Unless information is presented from the viewpoint of the receiver's basic interest you will discover that

# OLIVITE

## Acid-Handling PUMP

How It Answers the  
Problem of Leakage



Illustrated is the stuffing box assembly of the Olivite Acid-Handling Pump.

Since pump leakage is probably the Number 1 Enemy when handling corroding solutions, note how in the Olivite Pump, extra precautions are taken to prevent leakage:

- 1 The stuffing box floats on two rubber rings which permits shaft and packing movement. The packing is not crushed nor is the replaceable shaft sleeve scored.
- 2 The lantern ring permits circulation of the lubricant, water, solution, or grease.
- 3 The resilient packing is of acid-resisting material styled for long life.
- 4 Simple spring loaded wing nut adjustment permits application of correct and proper pressure by the yoke on the gland and packing. No "monkey" wrench required.

Thousands of Olivite Acid-Resisting pumps have been supplied the Process Industries during the past 20 odd years. The values of these years of design, manufacturing and operating experience are embodied in every 1 1/4", 2" or 4" Olivite Pump you purchase. Bulletin 308-R provides full details. When writing us please outline your pumping problems.

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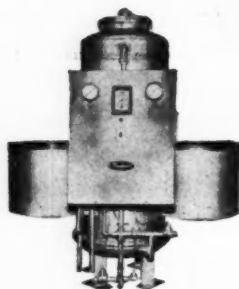
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## For Process, Boiler Feed & Other Needs



### COMPLETELY AUTOMATICALLY \*

Operating on the most efficient deionizing technique known (intimately mixed cation and anion exchangers in a single unit tank), raw water passes through a Penfield Automatic Mono-Column Demineralizer only once — yet comes out with resistance reported as high as 20,000,000 ohms. No heat or steam power is ever required and there are no valves to operate. Even regeneration is accomplished completely automatically by the simple flip of a single switch.

\*The new Penfield Mono-Column Demineralizer pictured above performs all its operating functions completely automatically — even recuts in effluent when proper pre-set purity is reached after automatic regeneration. Write for full information on units of any desired capacity up to 10,000 gph.

RUBBER-LINED, SARAN-LINED & NICKEL TANKS  
Specially fabricated to suit your individual requirements by Penfield's Tank Fabricating and Lining Division. Write today for complete details.

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Penfield "Planned Purity" PAYS!

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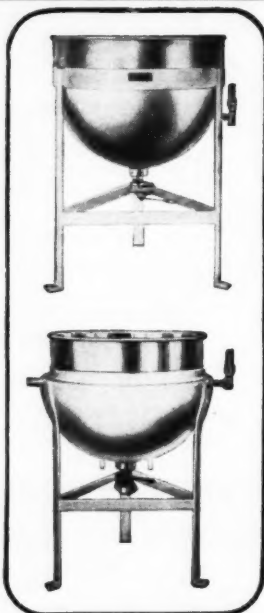
# LEE

## CORROSION-RESISTANT KETTLES

Lee Kettles meet every processing need. They are practical, easy to clean and keep clean, meet all sanitary regulations and are available in sizes up to 500 gallon capacity.

For longer service and greater all-around dependability, specify LEE Corrosion-Resistant Kettles.

Our descriptive technical bulletins sent on request.



**LEE METAL PRODUCTS CO., INC.**  
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ALL LEE KETTLES ARE MADE TO A.S.M.E. CODE

QED, cont. . .

the minds of your listeners simply won't stand still long enough for them to learn what you are trying to tell them. It must be clearly in their interest and in their terms."—R. K. Honaman, director of publications, Bell Telephone Laboratories.

### CONDITIONING SOIL

#### ...Three Ways to Destroy

How lasting are the new soil conditioners? According to Researchers R. M. Hedrick and D. T. Mowry of Monsanto (Krilium), who have recently studied the effects of soil conditioning treatment, there are at least three ways to destroy the polymer.

1. As happens to natural polyuronides, microbial or chemical action could break down the polymer. However, aggregates, under optimum conditions for microbial action, have remained stable after 31 months.

2. The polymer might be leached from the soil. In one experiment, 40 g. of treated soil crumbs were leached for 6 weeks with 8-10 liters of water per day. Result: Crumbs did not break down, the amount of polymer leached away was negligible.

3. In conditioned soils or in natural soils of good structure, mechanical break-down, usually caused by overtilage and compaction, can destroy tilth. In one experiment, treated soil crumbs were dried and then pulverized. Result: The crumbs did not reform as many large aggregates after remixing with water, but the soil still had good working properties.

Ammonium hydroxide, used in a large excess, completely regenerated the pulverized soil. Probably, it desorbed the polymer from primary particles and allowed the polymer to be readsorbed into stable aggregates.

### HIRING ENGINEERS

#### ... Dismal Forecasts

"In June of 1951, there were 3,600 chemical engineering degrees conferred. This year, the number will not exceed 2,800. In 1953, the figure will certainly not exceed 2,200 to 2,300, and the class of 1954 should provide about the same number. In 1949, 4,000 degrees were conferred in this field . . . It is currently estimated by competent authorities that

## MEMO

*The Hagan Ring Balance  
Dual Meter is the  
most adaptable  
flow meter made...*



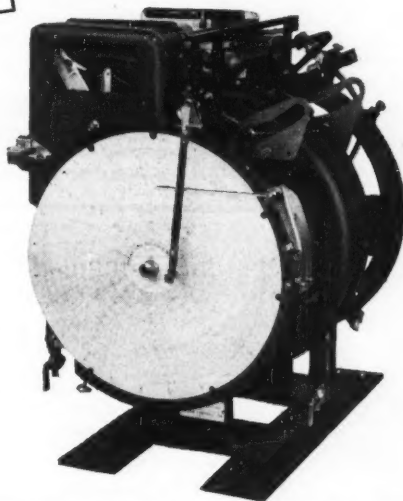
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here are  
four  
typical  
applications:

- MEASURE TWO INDEPENDENT FLOWS:** The Hagan Ring Balance Dual Ring Flow Meter will record two rates of flow on one chart, as, for example, steam flow and air flow, or gas flow and air flow.

- MEASURE TWO FLOWS SEPARATELY, ADD AUTOMATICALLY:** The Hagan Ring Balance Dual Ring Flow Meter will record flows from two separate lines, and integrate and record the total flow.

- MEASURE TWO FLOWS SEPARATELY, SUBTRACT AUTOMATICALLY:** For split flows, The Hagan Ring Balance Dual Ring Flow Meter will measure the main flow and the flow through one branch, record these flows and the difference between them, (this difference being the flow through the second branch), and will integrate any two flows automatically.

- FLOW MEASUREMENT CORRECTIONS AUTOMATICALLY MADE ON BASIS OF GRAVITY OR DENSITY:** One unit of the Hagan Ring Balance Dual Ring Flow Meter measures flow, the other measures gravity of a liquid or gas density. Records may show corrected or uncorrected flow rates, gravity or density measurement, with automatic integration of either flow rate.



The Hagan Ring Balance Dual Ring Flow Meter may also be compensated automatically for temperature and pressure factors.

**For information** on how Hagan Ring Balance Meters can solve your particular metering problem, write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

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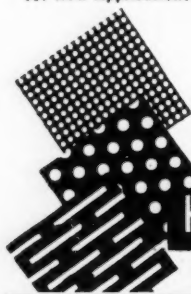
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**DUST-TIGHT  
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With **2 Exclusive Design Features**

R & S Type DL Lighting Fixtures contribute outstanding advances in fixture construction and installation simplicity! They operate very cool—way below allowable temperatures for this type of installation.

Two exclusive design features, in addition to basic advantages common to other well-constructed dust-tight fixtures, assure faster, easier installation, cleaning and relamping. They're made of cast aluminum alloy—designed with streamlined simplicity—and shaped to prevent dangerous accumulation of dust particles. Write for Information Data Sheet No. 7151-5.

Pendent and Junction Box bases standard to all fixtures. They accommodate any fixture—globe—reflector assembly in 100 or 200 watt sizes.



1 Lampholders are located within the conduit box assembly of both pendent and junction box types, permitting installation and wiring without regard to size or style of fixture.

2 All fixture—globe—reflector assemblies fit either base and are easily attached or interchanged by means of a simple bayonet slot and screw arrangement, without disturbing electrical connections.

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PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

QED, cont. . .

this year there are 80,000 engineering jobs to be filled, exclusively of military requirements. This demand must be met by less than 41,000 engineering bachelors."—Westbrook Steele, President of the Institute of Paper Chemistry, before the organization's Sixteenth Executives' Conference.

## UTILIZING ENGINEERS

. . . *Get Going*

To offset the superior numbers of scientific and engineering help in the Soviet Union and the nations dominated by the Soviet Union, the free nations will have to make good use of their superior scientific and engineering skills. To do this, the Engineering Manpower Commission of the Engineering Joint Council urges immediate action by both military and business leaders.

To get the most out of the engineering pool, the commission, in a recent statement, urged American industry to:

1. Establish manpower budgets similar to those recommended for the military.
2. Study the duties of engineers and scientists in order to transfer to supporting personnel those duties not requiring full engineering or scientific skills. Do not hire engineers for jobs in which their skills are not really needed.
3. Move engineers to positions of maximum responsibility as rapidly as possible taking account of their need, ability and experience.
4. Do not hold engineers or scientists in internship or training positions for overly long periods.
5. Maintain salary differentials between senior engineers and newly graduated engineers.

To properly utilize engineers in the armed forces, the commissions urges the military to:

1. Establish manpower budgets for engineers.
2. Make a distinction between professional engineers and technicians. To do this, the military will have to re-examine its billet designations and military occupational specialties files. Technicians can be trained in a matter of months; the professional engineer is the product of at least four years of full time study coupled with more



years of development and experience.

3. Recall engineers to active duty only when they can be fully used in their specialties.

4. To get the most out of their skills, commission in their specialties all engineering graduates who are inducted through Selective Service.

5. Provide for interservice transfer of persons having special skills.

6. Provide for the release from active duty of those engineers and scientists not needed as such.

## ABATING AIR POLLUTION

### . . . With Electron Microscopes

The electron microscope is helping pollution authorities pinpoint sources of smoke. By magnifying a specimen up to 50,000 times its actual size, the microscope enables a chemist to identify the specimen's source—whether it is from an industrial smokestack or a trash fire in an incinerator. By this method, says W. C. McCrone, Armour Research Foundation, it is also possible to identify fibrous materials found in air pollution, such as paper cloth and feathers.

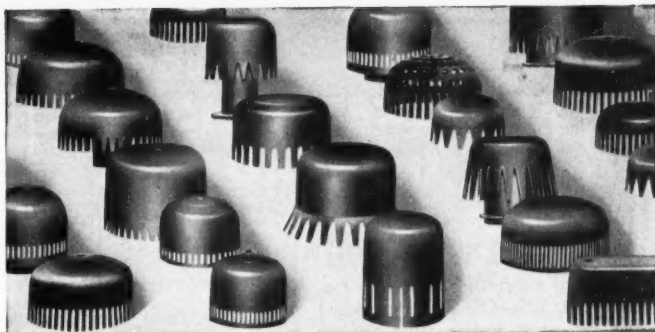
## MAKING PREDICTIONS

### . . . For Impact Styrenes

During the next 10 years high-impact polystyrenes will make a name for themselves in the plastics industry; they will particularly have great influence on injection molding and extrusion operations. By 1962, according to Researcher J. S. Whitaker, Bakelite Co., over 600 million pounds of styrene may be needed by the industry—a growth similar to that of polystyrene since 1942.

Primarily responsible for the upshoot, research has been continually increasing strengths of the product. The strengths of the medium and high impact types of styrenes, says Whitaker, who spoke at the recent annual meeting of the Society of Plastics Industry, have already been extended. Right now a super high impact styrene with an Izod strength about 15 times that of the unmodified polymer is available in development quantities.

Even under present strength limits, a large number of new products are



SEND FOR PSC

## BUBBLE CAP BULLETIN 21

*Largest Compilation of Engineering Data.*

*Lists 200 Styles Furnished Without Die Cost.*

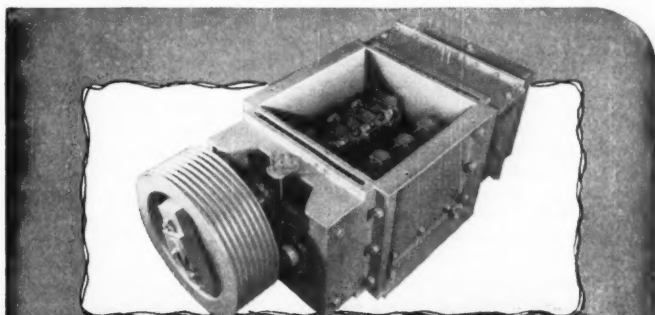
This standard reference contains complete specification information for over 200 standard styles of bubble caps and risers. Also drawings for use in determining methods of tray assembly. All styles list-

ed in Bulletin 21 are furnished promptly, without die cost, and in any alloy to meet your coking or corrosion problems. Special caps gladly designed; write as to your needs.

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## PRATER Industrial Model CRUSHER-FEEDER

*For First-Stage Reduction of Bulk Materials*

This economical unit will reduce lumpy materials, from their original bulk state to an exact degree of uniformity as predetermined by the feed gate adjustment. The cast alloy cutting rolls—rotating in opposite directions toward the heavy duty shear bar—provide a powerful crushing action. The Prater Crusher Feeder is designed for heavy duty serv-

ice. It is compactly built, suitable for mounting independently, on a grinder or other process unit, or in close proximity. Quickly demountable rolls are easy to service. Fully enclosed machine-cut gears, running in oil, and safety shear pin hub on drive pulley add greatly to the life of the unit. Built in 4 types and sizes. Write for details and prices.

## PRATER

PRATER PULVERIZER COMPANY, 1517 So. 55th Court, Chicago 50, Ill.

possible. For example, he points out, the present range of notched Izod (1 to about 10 ft. lb.) can be divided up. If this is done, we can have 10 new additions to the styrene family.

"That, I believe, represents more product variations than will be required to satisfy the major uses for these materials. One of our problems will consist of finding those two or three types that give adequate end-use spread and permit reasonable inventories."

What will the new properties of high impact styrenes mean to the industry? According to Whitaker:

1. Increased elongation will mean better mold release, the ability to strip from threads, fewer rejects from breakage at the injection machine, and the ability to bend sections during assembly of finished articles.

2. Higher impact will mean fewer rejects during handling and shipping, and new serviceable consumer items.

3. Relatively high heat distortions for tough materials will mean better store window displays.

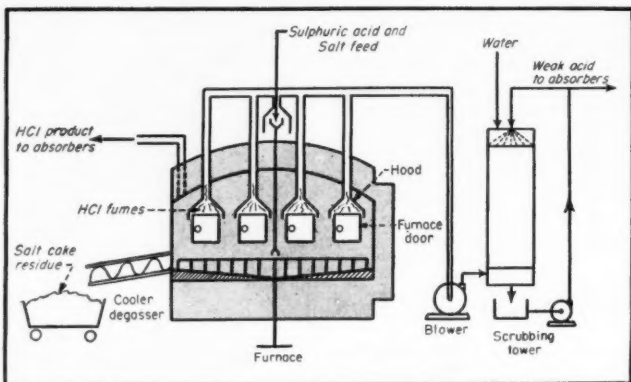
## RECRUITING ENGINEERS

### . . . Untapped Resources

Apparently most young women going to college do not believe they would make good engineers. Today men students enrolled in our engineering colleges outnumber women 250 to 1. At the same time, many professional people feel that women have only a limited place in engineering.

One who doesn't, however, is President W. V. Kahler of Illinois Bell Telephone Co. "In my opinion, this is mistaken thinking and not realistic in today's modern industry where we need to encourage creative engineering talents wherever they may be—regardless of whether they belong to women or men.

"With far too few engineers being trained today in our technical schools and colleges," Kahler says, "engineers even more than any other group of people have a responsibility to encourage and even recruit young people to take up engineering careers. In carrying out this responsibility, engineers should not overlook the potential engineering talent possessed by many young women."



MECHANICAL FURNACE for making HCl allows little HCl gas to escape; but . . .

## We Still Smell a Little

. . . at the Cleveland Works, where HCl has been fouling the passing air, says a DuPont engineer. But, as a result of recent changes, not nearly as much as we once did.

Formerly in making HCl at its Cleveland works, Du Pont would lose about 4.5 tons of HCl a day in the oft-abused Ohio atmosphere. However, in recent months while their good neighbors were still unaware, Du Pont engineers cut this amount to a hardly noticeable 0.5 ton a day. This past summer, Assistant Technical Superintendent H. C. Hosford of the Cleveland Works, Grasselli Chemicals Department, told how his company managed to work out its chief problem in HCl contamination.

Speaking at the annual meeting of the Air Pollution and Smoke Prevention Association, Hosford suggested that the old pot and muffle system of making HCl was primarily to blame. In the pot and muffle furnace the charge of salt and sulphuric acid was worked by hand as it proceeded through the reaction; as a result, large amounts of HCl gas would roll out the furnace doors during the reaction period.

In addition, when a charge was completed, the salt cake residue was discharged into tram buggies at 1,000 deg. F. and sent to storage. At the time the cake still contained enough reacting salt in it that the gas would literally roll up in clouds as the buggies rolled along.

"We thought we were doing very well on these systems if we got a 90

percent yield, leaving 10 percent that we did not recover. Roughly 8.5 percent out of the total loss of 10 percent was a gas loss to the air, and at practically ground level," said Hosford.

By 1949 however the last old furnace was replaced by mechanical furnaces. In mechanical processing, salt and acid are fed into the furnace continually and rotating arms and plows rabble the charge; the salt cake residue is discharged continually.

At best some gas still leaks out the furnace door. To prevent this from escaping to the air, Du Pont has installed collecting hoods over these doors (see cut). The hoods are under suction from a large fan; gas is drawn through ducts to a packed scrubbing tower where the HCl gas is absorbed in water.

**Better Process**—In mechanical processing, the discharged cake no longer fumes. To stop the fuming, Du Pont has installed a cooler-degasser—a water-cooled screw conveyor that receives hot gassy salt cake from the furnace and cools it down rapidly, thus preventing any leftover salt from reacting.

"Since putting in this operation," he said, "there is not a trace of gas or odor in the salt cake discharged from the cooler, and cake can be transported to storage without contributing in the slightest to air contamination." Since installing the

## Hooker Chemical Guide (ONE OF A SERIES)

USE this handy reference to save time  
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# HOOKER SODIUM BENZOATE BENZOIC ACID

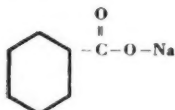
A GRADE TO FIT YOUR NEEDS, USP OR TECHNICAL

## SODIUM BENZOATE USP and Technical

Synonym: Benzoate of Soda

Formula:  $C_6H_5COONa$

Appearance: White, odorless, crystalline solid, sold in flake or powdered form.



### TYPICAL PROPERTIES

#### USP GRADE

Molecular Weight ..... 144.1  
Sodium Benzoate ..... 99+ %  
Benzoic Acid ..... 0.2% max.  
Water ..... 0.5% max.  
Description: Meets all chemical and physical requirements of U.S. Pharmacopoeia XIV.

#### TECHNICAL GRADE

Molecular Weight ..... 144.1  
Sodium Benzoate ..... 98% min.  
Benzoic Acid ..... 0.4% max.  
Description: Does not quite meet the requirements of U.S. Pharmacopoeia XIV.

### USES

Food Preservative: foods, fruit juices, syrups, margarine.

Antiseptic: pharmaceutical and cosmetic preparations, tooth paste.

Tobacco Curing

Corrosion Inhibitor: for glycol antifreeze solutions, solvent type metal cleaners, etc.

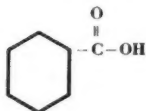
Chemical Intermediate: dyestuffs and pharmaceuticals.

## BENZOIC ACID USP and Technical

Synonyms: Benzenecarboxylic Acid  
Phenylformic Acid

Formula:  $C_6H_5COOH$

Appearance: White, crystalline solid, USP grade is available in powder form. Technical grade is available either in powder form or in the form of very small bead-like particles.



### TYPICAL PROPERTIES

#### USP GRADE

Molecular Weight ..... 122.1  
Benzoic Acid ..... 99.3% min.  
Water Content ..... 0.2% max.  
Description: Meets all chemical and physical requirements of U.S. Pharmacopoeia XIV.

#### TECHNICAL GRADE

Molecular Weight ..... 122.1  
Benzoic Acid ..... 98.0% min.  
Water Content ..... 0.2% max.  
Description: Does not quite meet the chemical and physical requirements of U.S. Pharmacopoeia XIV.

### USES

Chemical Intermediate: dyestuffs, perfumes, pharmaceuticals, benzoates, flattening agents for paint.

Preservative: for textile sizing, foods, cosmetic creams, lotions.

Antiseptic: for dentifrices and pharmaceuticals.

Tobacco Curing

Dyeing Assistant: for polyglycol terephthalate fibers (Dacron). Benzoic acid has a swelling effect on some of the new synthetic fibers. This gives better dye penetration with resulting level, long lasting color.

For detailed information on items listed, drop us a note on your letterhead. Address your request to  
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*From the Fall of the Earth*



2-326

## MODERN TIME AND COST SAVERS BUILT BY...

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GRAVITY & POWER  
CONVEYORS



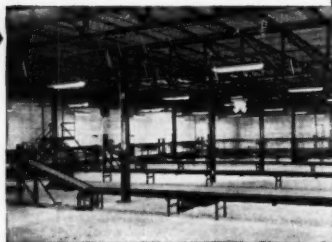
### Save Time Loading — UNLOADING with the EXTENDOVEYOR

This compact, mobile, easily maneuverable power-belt conveyor unit extends to 46' in either direction and retracts to 9' 10". Reaches into cars, trucks, trailers. Handles boxes, bags, bundles, cartons, crates, cases weighing up to 150 lbs. Available in two models — 1 way stretch and 2 way stretch — and 4 sizes. Write for Extendoveyor Bulletin — address Dept. CM-52.

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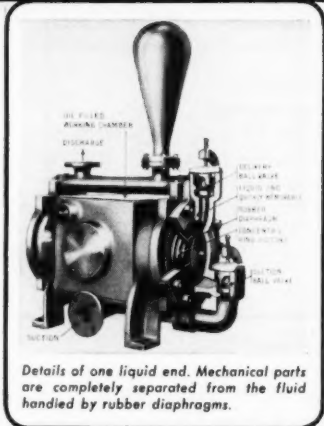
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63-8, address  
Dept. CM-112



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Here's the ideal pump for corrosive, abrasive, viscous, thick, heavy, delicate or hazardous materials or fluids which clog or build up on pump parts. Economical—low maintenance—truly the pump that "can take it."



Details of one liquid end. Mechanical parts are completely separated from the fluid handled by rubber diaphragms.

Write for Bulletin 126

## Shriver Diaphragm Pumps

**T. SHRIVER & COMPANY, Inc., 802 Hamilton Street, Harrison, N. J.**

QED, cont. . .

mechanical furnaces, Hosford believes, the company has cut its gas loss to the air by at least 90 percent.

Besides installing equipment to directly handle contaminating gas, Du Pont has also considered possible equipment breakdown, operator error and things of that sort. The company has instituted preventive maintenance programs and scheduled shutdowns for inspection and repair.

To minimize errors, operators are intensively trained in standard procedures. At the Cleveland Works, complete and detailed instructions are given to all operators. When a new operation is to be started, the operators go through an extensive pre-start-up training that includes dummy runs with water or an inert solid.

"Through a continual program of education of operators, emphasis is placed on the necessity for always keeping emissions to a minimum. Operators are told that they must shut down completely, regardless of any other considerations, if emission should become excessive and they are not able to correct the condition at once," said Hosford.

**Other Headaches**—Probably the greatest pollution truant at the Cleveland Works has been the HCl. But since 1949 the principal source of trouble, the pot and muffle furnace, has been eliminated. However, there are other sources. "We still stink a little," said Hosford. "We have another operation for the production of sodium bisulphate from salt and sulphuric acid where there is some unavoidable loss of HCl. We are going to install hoods and ducts and scrubbers on this system also.

"We have another point in the works on a concentration operation where about 350 lbs. per day of HCl is being discharged to the air. But a hood and scrubber are being designed to collect and scrub out this HCl. This one is proving to be a little tough from a design standpoint. But we will lick it before long."

At the Cleveland Works, Hosford explained, Du Pont is trying to remedy any condition that could possibly lead to annoyance, before neighbors actually complain. The company knows that pollution abatement seldom, if ever, pays for itself. "There are scarcely any instances where there are tangible returns on the investment and operating cost. The return



is in the retention of the good will of your own people, of your customers and of your neighbors," Hosford concluded.

## PLANNING EXPANSION

### ... Advice From a Banker

"We are approaching the point where the defense build-up will be having a maximum effect upon the economy," said Vice President Roy Reiersen of Bankers Trust Co. this spring to conferees of the American Management Association at New York's Statler.

"The maintenance of continued high defense outlays will help support the economy against a major downturn in the aggregate, but the effect of this support will obviously be smaller than during the period of rapid build-up.

"Furthermore, it appears that current levels of business spending on plant and equipment are at a cyclical peak; it is estimated that manufacturing capacity by the end of 1952 will have been increased by almost 50 percent since the end of World War II, which is apparently well in excess of our normal growth. Thus, the economy in future years is less likely to receive the boost it has hitherto derived from a persistent rise in plant and equipment outlays.

"Finally, the huge deferred demand for consumer goods which was a major contributor to the economic boom of the postwar period has about disappeared; at the present levels of prices and incomes, there are no accumulated backlogs of demand for consumer durable goods. The housing boom is already mature, judged by past experience.

"However, there are some backlogs in other sectors of the economy; several years of high activity in public construction will be required to provide for the pressing needs for schools, hospitals, roads and many other public facilities. Also, consumer spending can be stimulated by a reduction in taxes. But, by and large, some question may be raised as to our ability to use fully the increased productive capacity that will be available.

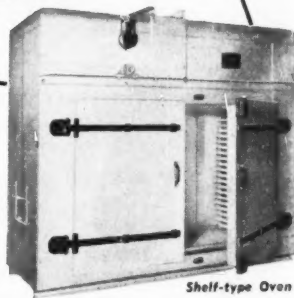
"This is not a forecast of depression. There are too many imponderables in our complex economy to make forecasts with any real assurance. In the international field we must balance the possibility of peace in Korea, with its portent of further

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Write for Bulletin 17.

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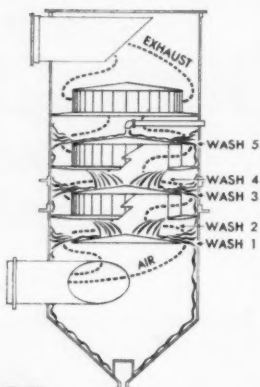
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QED, cont. . .

downward pressure on prices and production, against the ever-present danger that other trouble spots in the world may erupt into violence.

"Labor difficulties may interfere with production and bring in their train unknown complications. The political scene is in a state of flux, we have no way of forecasting government policy in the economic field over the next four years.

"Of one thing, however, we can be certain: the need for caution on the part of business management is probably greater today than it has been for a decade. We appear to be in the high range of the current cyclical movement of production and prices. Business in the future may be less able to raise selling prices if costs increase, and this may materially affect its profits."

## PREVENTING ACCIDENTS

### . . . Vent Your Drums

This past summer a 55 gal., 14 gage, drum filled with sulphuric acid blew up in an outside drum yard of a U.S. chemical plant. Acid shot out of the drum with such force that the drum, which was originally on its side, jumped on end.

At the scene of the accident, investigators found that the blown out drum head had a  $\frac{3}{4}$  in. bulge in it. About 30 gal. of acid remained in the drum.

One of three kinds of pressures, investigators figured, could have caused the rupture: hydrostatic, vapor or hydrogen pressure. The first two possibilities were immediately ruled out. Hydrostatic pressure would not have ripped the drum head off the drum, nor would the pressure have continued long enough to up-end the drum. And the contents of the drum were not hot enough to produce a sulphuric acid vapor pressure sufficient to cause such a severe blow-out.

Although the cause most likely was excessive hydrogen pressure, investigators at first were skeptical. Reports showed that the blown out drum was filled with 93 percent sulphuric acid about one month prior to the accident. Normally, hydrogen, which is generated when the acid attacks the steel drum, forms slowly. But recent extremely hot weather might have hastened the attack on the drum walls,



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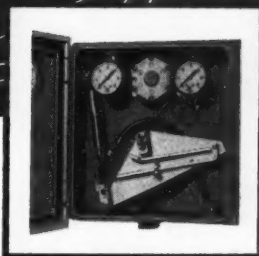
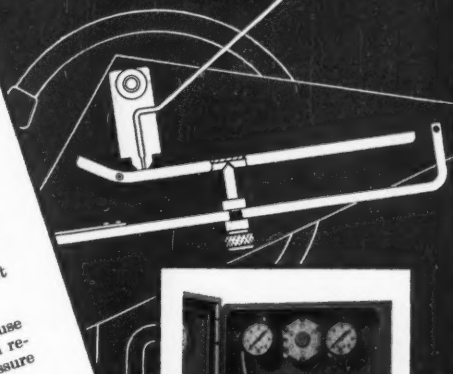
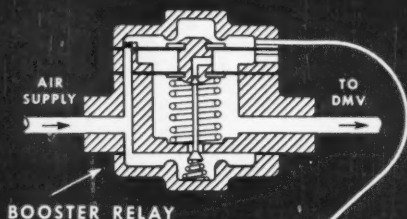
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Internal view at top shows arrangement of elements depicted in diagram. External view at bottom shows Pressure Pilot with door closed.

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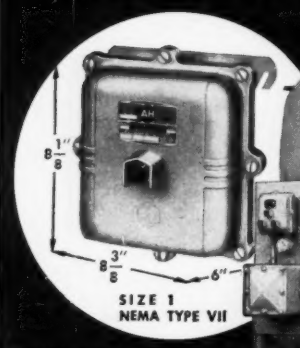
*First in Controls*



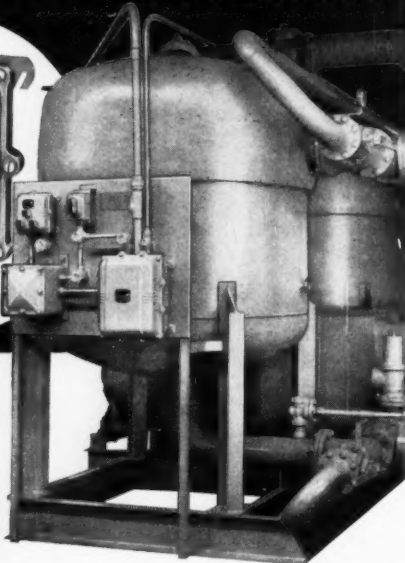
### ● Important Reference Data

Write for new Bulletin 16-1, "Honeywell Pressure Pilot."

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You can choose from a complete line of EXPLO-SAFE Starters and Contactors in sizes 00 and 0 through 4, with all auxiliary equipment. Send for fully illustrated EXPLO-SAFE bulletin containing complete engineering data, operating features, dimensions and ratings.

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QED, cont. . .

increased the pressure of the hydrogen after it was formed.

Anyway, an analysis of the acid remaining in the drum showed an assay of 91.8 percent. In addition, a considerable amount of white sludge was found in the sample that they examined.

In the future at this plant, all drums containing 93 percent sulphuric acid will be vented at least once each week. Sufficient outage, the Chemical Section of the National Safety Council suggests, should also be left when filling 93 percent sulphuric acid drums to allow expansion of the contents without producing hydrogen pressure.

## BUILDING CHARACTER

### . . . No Fear of Halley

"Engineering training by our universities has other great values to the country than its industrial consequences. It instills character in those who would join its ranks, for high ethical standards are the essential of all professions . . . These are the reasons you have seen no engineers before the Kefauver Committee."—Herbert Hoover in an address before the recent Northwest Engineering Centennial.

## PROCESSING SHALE

### . . . Promising Method

What is the most promising method for retorting oil shale? Direct heat transfer from hot gas to a bed of broken shale, say W. E. Wells and J. R. Ruark, who have conducted pilot plant investigations of Colorado oil shale for the Bureau of Mines. "The heat transfer rate," they say, "is rapid compared with indirect methods of heating, and the method may easily be adapted to continuous operation."

## STUDYING A CATALYST

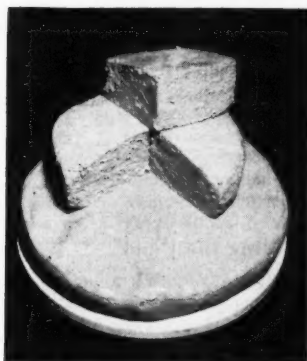
### . . . For Its Activity

The catalytic activity of activated alumina in dehydrogenating propane decreases as firing time and firing temperature increase. Data, collected by G. L. Farrar at the Texas Engineering Experiment Station, would indicate that there is a constant activity reached after long firing time at a given tem-

perature, and that this activity is a function of the firing temperature.

According to the station's magazine, News (Sept. 1952) Farrar made seven activity determinations on unfired alumina and 27 on samples of alumina that were fired at temperatures between 1,350 and 1,800 deg. F. and for times varying from 5 to 288 hr.

Activity ratios (the residence time required for the untreated catalyst to produce a given conversion divided by the residence time required for the treated catalyst to produce the same conversion) for several fired samples were tested at two values of propane space velocity; the same activity ratio was obtained at both space velocities, in all cases.



## MAKING CHEESE

... From Cottonseed

Cheese has been made from cottonseed kernels at the Texas Engineering Experiment Station. After some additional study, W. W. Meinke, who developed the process, expects to make a protein food comparable to that prepared from milk.

The process for making cottonseed cheese, according to the station's News, (Sept., 1952) is somewhat like that used in making dairy cheese. However, cottonseed milk is prepared with salt from raw, rolled cottonseed kernels; curds are made from the solution by the addition of lactic acid. Then the heads of the curds are ripened by specific bacteria.

Follow-up work on the experiment has begun. Meinke hopes to completely remove a purple color that has been tainting present curds. In addition, more extensive studies will be made on (1) the bacteria that makes the acid that coagulates the

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## VERTICAL TURBINES

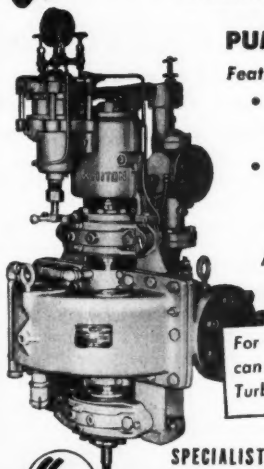
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QED, cont. . .

protein and (2) the specific bacteria used in making the cheese.

**How It's Done**—To make the curds, 1,000 grams of cottonseed kernels are first rolled and then washed with water. The kernels are then dropped into 6 liters of 0.5N sodium chloride solution and stirred for 2 hr.

A basket-type centrifugal filter then separates the protein solution from the residual solids. Lactic acid is then added and the protein precipitates; pH is 3.5. A Buchner funnel then removes the whey from the curds. A yield of 375 grams of 23.8 percent protein curd represents a 20 to 25 percent recovery of the protein present in the 1,000 grams of cottonseed.

## STUDYING CATALYSIS

### . . . Chief Soviet Problem

With each succeeding year, the chemist comes more frequently and more boldly to catalysis for the solution of his preparative and industrial problems, says Soviet Scientist S. Z. Roginski. Because of this, the problem of catalysis has become one of the central theoretical problems of Soviet chemistry.

## LOOKING AHEAD

### . . . Jet in Your Future

Frank Lloyd Wright, the 84-year-old American architect, believes man was not made for hurried living; in fact, he says the idea of speed is voracious. On the other hand, Gustav Egloff, director of research of Universal Oil Products Co. and reigning seer of the petroleum industry, believes that speed is a reliable function of progress.

"People, airplanes, boats, trains," he said at the recent convocation of engineers in Chicago, "they're all too slow."

Within the next 100 years, Egloff says, people will be zooming through the air between home and office; fathers will be flying out for a quart of atomized ale; mothers will be maneuvering through the supermarket's roof entrance; kids will be chasing canaries across the sky and grandma will be gliding gracefully off for a week-end at Waikiki.

# A Safety Engineer Is In On Everything

- When a plant is being designed, he starts to work.
- When it's being built, he makes important decisions.
- When it's being operated, he sets up safety standards.
- When it's being maintained, he makes many inspections.

**NOTE:** American Cyanamid officials believe they cannot afford to run an unsafe facility. "We feel that a large number of accidents would be an unfavorable reflection upon our ability to design, to construct, to maintain and to operate," says Director S. F. Spence of Cyanamid's Safety and Fire Prevention Department. At the recent Central States Safety Conference in St. Louis, Spence told safety men just how this company applies safety engineering principles to its operations. His paper is the basis of this QED feature.

—EDITOR.

## Designing the Plant

In designing a new process, the safety engineer is called into the plant engineering department as soon as preliminary flowsheets are developed. In following-through the new flowsheets, new department layouts, department revisions and redesign of processes, the safety engineer usually goes step-by-step through the process. For example, he would consider the reaction kettle:

- Is this an exothermic reaction?
- How is temperature controlled?
- How are dry materials added?
- How are liquid materials added?
- What type of controls?
- Any foam-over problem?
- Are components of the product flammable or toxic?
- Physical size of the vessel?
- Size of manhole?
- Is there adequate vertical clearance over the manhole for man removal?
- Would the reaction run away if the electrical power on the agitator were lost?

Are drowning or reaction killing methods necessary?

Details of pressure relief, the size, types and where discharged?

To do this job, the safety engineer must have a thorough understanding of the over-all operation—how raw materials are received, how they are

transferred to and through the process, what are the temperature and pressure conditions and the instrumentation through the process?

The safety engineer has to especially be aware of details. Some of the tremendous trifles may be:

Tankcar unloading and loading facilities.

Storage tank gaging methods.

Access to high or low points for operator observation and checking.

Sampling methods.

Valve accessibility.

Liquid transfer controls.

Liquid level controls.

## Building the Plant

As soon as a job is sent out for bid, the plant department heads, the project engineer and the safety engineer set up a policy for the contractor. They will have to come to a decision on these points:

1. What will be the boundaries of the job area? Will barricades be erected around the area?
2. Where and what types of structures will be set up for field offices, equipment and storage buildings?
3. How will wastes be disposed of?
4. What will be the system of control for contractor's vehicles, equipment and personnel on the plant? Parking areas for contractor's employees?
5. How much of the plant medical facilities will be used?
6. Will the job site be classified as a fire safe location? If not, what will be the plant procedures covering use of the safety work permit?
7. What will be the fire protection for the job? Sanitary facilities?
8. What information must be given to the contractor covering hazards caused by plant processes and storage, both on the site and in the immediate area?

The decisions, which are eventually reduced to writing, are usually made



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**enjoy efficiency—**

## **specify chemical feeding equipment**

### **No Corners or "Dead-Spaces" with INFILCO Wet Chemical Mixers and Feeders for Volumetric Feeding**

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### **Freedom from Mechanical Difficulties with INFILCO'S Type "E" Dry Chemical Feeder**

The type "E" Feeder is a non-clogging feeder which delivers a measured amount of chemical by extrusion off both ends of a stainless steel pan as it follows a reciprocating and tipping motion. A linear setting is provided for adjusting the rate of feed throughout the entire capacity range of the feeder. Either constant rate or automatic proportional feeding may be furnished and the feeder may be equipped with a counter to total the number of pounds fed. Results are comparable to a gravimetric feeder without the expense, complications and maintenance of such feeders. The simple operating principle assures high accuracy, efficiency and freedom from mechanical difficulties. Request Bulletin 215-A for complete information.

### **Simple Operation of the Neusol Feeder is Your Solution for Solution Feeding**

This PNEumatically activated SOLUTION full-view plastic constructed pump, with no metal surface exposed to the liquids handled, permits accurate feeding of corrosive solutions. Self-priming and extremely flexible in its application to solution feeding problems the NEUSOL FEEDER, with a minimum of moving parts in the feeder and only one in the pump itself, is simple to operate and maintain. The rate of feed is determined by the position of the rate setter dial which may be set for any value between 0% and 100% of the feeder capacity. For descriptive literature request Bulletin 340.

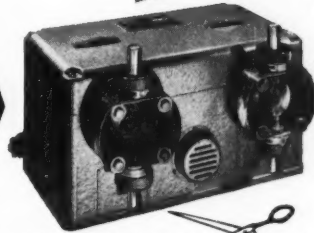
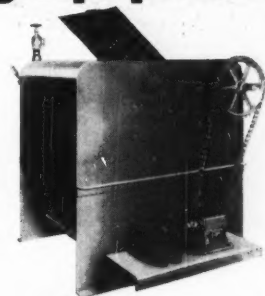
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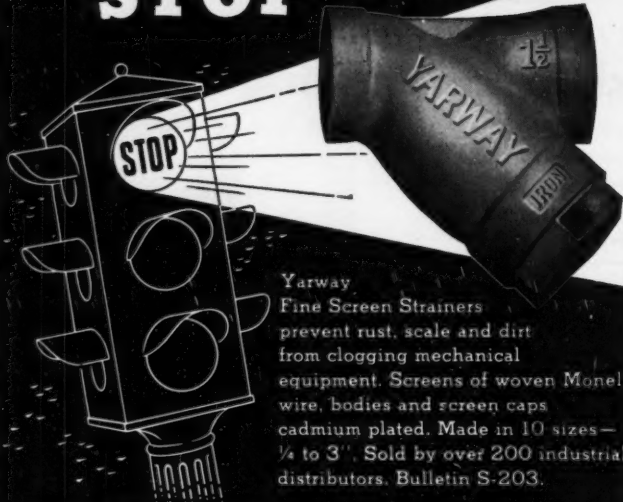
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**QED, cont. . .**

available to the resident and project engineer. Agreements covering safety and fire protection are then agreed upon with the contractor, put in writing and made binding.

### Running the Plant

The safety engineer has to keep in close touch with operations, particularly plant changes. He usually will make a detailed process flow review with each operating supervisor once a year, noting any changes no matter how small. Hazardous operations are then reanalyzed and operating procedures reviewed.

Safety standards will have to be set up. They are usually the result of the safety engineers effort—but with the full assistance of all plant divisions or departments concerned. In most instances, they cover the broader subjects of plant operations. In the average chemical plant, they may well be:

- Stairways, platforms and walkways.
- Portable ladders.
- Hose and fittings for use with air, water and steam.

They may also cover these operations:

- Tank car loading and unloading.
- Entering tanks and other enclosed spaces.
- Storage and handling of flammable liquids.

Handling compressed-gas cylinders.

To keep his finger on operations, the safety engineer usually checks work orders. If the work warrants his attention, he usually sets up with the operating department and mechanical department a schedule date for completion. He then follows through with the safety of the job as it progresses. He finally reviews the passes on it.

In addition, the safety engineer has to set up and carefully follow through on safety work permits—an important operation in any chemical plant. Before issuing a permit, he will have to note every case where work, by company employees or outside contractors, may subject company personnel, equipment or property to hazards.

However, the responsibility for making the work place safe, for instructing the workmen in the hazards of their environment, and for filling out the permit form, rests with the supervisor in charge of the work place. For example, if a tank is to be entered by a mechanic, the supervisor of the

department to which the tank is assigned, has this responsibility.

### Maintaining the Plant

Working with the preventive maintenance program, the safety engineer has to check on all preventive maintenance schedules for inspection and replacement:

1. Hoisting equipment, safety showers, ladders and pressure relief valves are checked.

2. Proper inspection check lists are developed and used.

3. Proper procedure is established for any indicated corrective action.

4. The parties concerned in inspection reports. They will usually be the operating department being worked, mechanical department and the safety department.

5. He stays on top of the safety inspection schedules. He must keep a check list to make sure that inspection procedures are followed as scheduled.

### COATING METALS

#### ... The Ideal Ceramic

Asking for the ideal ceramic coating would be like asking for a metal as strong as tungsten, as light as aluminum, with the conductivity of copper, a melting point of about 6,000 deg. F., and the oxidation and corrosion resistance of platinum. This would be a pretty good metal, comments Research Director John V. Long, Solar Aircraft Co.—if it could be made.

However, a good ceramic coating should have certain outstanding properties, or combinations of specific properties, if it is to do its assigned job well. Speaking at the recent SAE national aeronautic meeting, Long described seven such essential qualities.

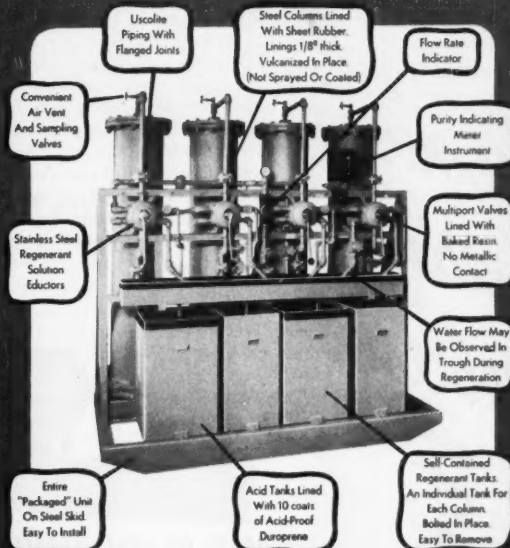
1. The coating should have good bond to the base metal under all conditions of use. The bond should not deteriorate under extended heating, nor sharp gradients of temperature.

2. It should have chemical and physical stability in the operating temperature range. The coating might soften slightly at high temperatures, but it should not become too fluid nor should it react with the base metal.

3. It should be sufficiently impermeable to prevent or substantially inhibit oxidation of the base metal.

4. It should have excellent thermal and mechanical shock resistance. It

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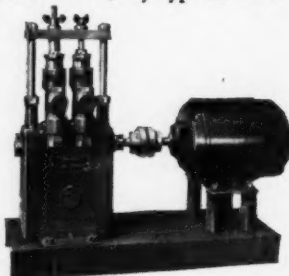
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QED, cont. . .

should not reboil nor spall with sudden temperature changes, nor should it chip easily under mechanical stress.

5. It should have a degree of resealing ability; if there is mechanical damage or processing imperfection, healing or recovery will be effected in operation.

6. It should not detract from the strength of the fabrication, but rather should add to it. There should be little or no diminishing of the original ductility and strength of the metal at operating temperatures.

7. It should be workable enough to be satisfactorily applied to a part and leave no surface discontinuities. It should set up no destructive stresses in the metal. Its maturing temperature should fit the normal processing of the part, and should be sufficiently low so no special firing equipment is required.

#### **ABATING POLLUTION**

##### **. . . Natural Processes**

Every river and stream can safely handle a certain amount of waste, depending upon its runoff, climatic setting and the topography of the surrounding land. According to C. J. Velz, Chairman of the Department of Public Health Statistics, School of Public Health, University of Michigan, we should define the allowable pollution loads of our waterways, and make use of their self-purification capacities. "We cannot afford the luxury of non-use; neither can we afford unrestricted destructive abuse," he says.

#### **DESIGNING PLANTS**

##### **. . . A Better Concrete**

In the U.S., aggregate concrete is used more than any other lightweight concrete. In Sweden, however, chemically aerated concrete has not only dominated the lightweight field for the past 30 years, but has in fact revolutionized the whole building industry. Probably 70-80 percent of all the new homes built today in Sweden are constructed mainly or partly of lightweight concrete, mostly chemically aerated concrete.

This type of concrete, according to Eric Ahlstedt of International Ytong



## 27 GRAVER TANKS FOR SOUTHWEST POTASH CORP.



General View of plant at Carlsbad, showing Graver process tankage.

### All Graver Tankage at New Fertilizer Plant in Carlsbad, N. M.

To produce fertilizer for American agriculture, Southwest Potash Corporation recently began operations at its new \$11,000,000 mine and plant at Carlsbad, New Mexico. The plant was designed and built by Stearns-Roger Mfg. Co. of Denver. The 27 tanks erected by Graver's Banks Moreland Division constitute a part of the processing operation. Among the larger tanks for processing and storage are a 180' x 17' thickener tank, a 70' x 12' brine tank, 45' x 10' hydroseparator, and a 250-ton shift bin.

#### GRAVER TANK & MFG. CO., INC.

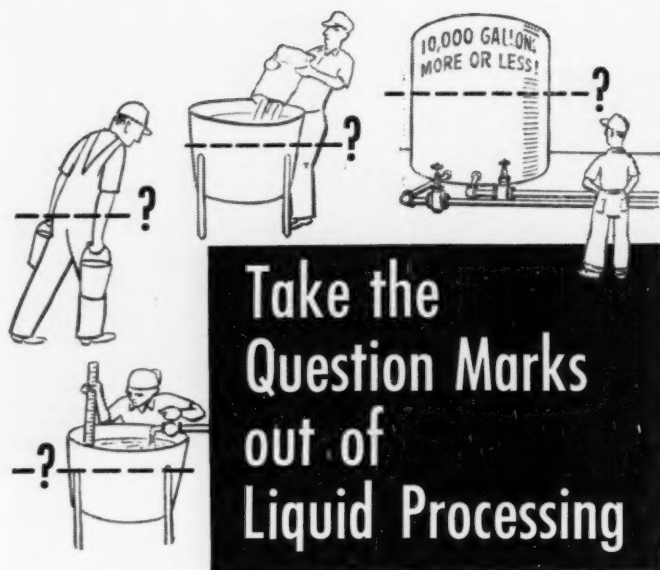
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180' dia. Thickener Tank, the largest of 5 such tanks for the flotation process.







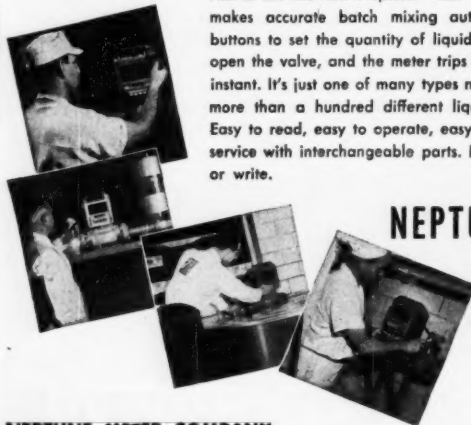
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### WITH *Accurate* NEPTUNE METERS

Why use wasteful methods of measurement when accuracy is so easy with Neptune meters? Fine-instrument precision gives you constant control over product quality at all times. No chance for human errors—the meters quickly pay for themselves by putting an end to spoiled batches, over-filling, spillage, etc. They save time, too, by eliminating slow weighing or batch tanks. Simple, easy to clean, they boost good house-keeping by keeping messy or hazardous liquids inside the pipe.

#### AUTOMATIC BATCH CONTROL

Ask to see the new Neptune "432" Auto-Stop—the meter that makes accurate batch mixing automatic. You simply push buttons to set the quantity of liquid required by the formula, open the valve, and the meter trips the valve shut at the right instant. It's just one of many types now available for handling more than a hundred different liquids. Composition bronze. Easy to read, easy to operate, easy to calibrate, and easy to service with interchangeable parts. For quick facts, just phone or write.



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QED, cont. . .

Co., a Swedish manufacturer of the material, has lower density and higher strength than any other lightweight concrete in the world.

Known as Ytong, it is manufactured out of a silica-rich shale ash and unslaked lime mixed in the proper proportions. However, many varieties of siliceous materials can be used as raw materials. They would include ordinary sand, coal waste, burned coal waste, fly ash with a low coal content, brick waste, blast furnace slags and pumice.

Today Ytong is manufactured in the form of large block for loadbearing external walls, internal walls, insulating slabs, floor slabs and window lintels. The blocks are used for construction of up to 5-story buildings in non-loadbearing construction.

Ytong in the form of slabs is also used as external insulation on reinforced monolithic concrete building of 12-15 stories. The slabs also serve as forms for the casting of the concrete structure.

**How Ytong Is Made:** In the manufacturing process, burned shale ash and lime are conveyed to the crushing section of the plant already mixed in proper proportions. They are carried by bucket elevators to raw material bins. From the bins, the material is put over feeders going to tube mills. After milling, the material is carried to silos. The mixing grade and the fineness of the pulverized material is carefully controlled by mechanical stirring devices and air agitation.

Screw conveyors and elevators carry the shale-lime flour to a mixing station where it is intimately mixed with water and where aluminum powder or another foaming agent, together with chemicals, are added. The rather thin slurry is put into molds where it rises and presets.

After a certain time it is cut into block and slabs of desired dimensions. By varying the proportions of raw material, the final material can be made in different densities.

After cutting, the units are cured in autoclaves using saturated steam at approximately 143 psi. High pressure steam curing, accelerates the setting, and after a short time the material can be transported to the storage yard where it is prepared for shipping.

Ytong products have been developed under conditions unique for Sweden; the same combination of raw

materials, tools and know-how may not exist in other countries. But according to Ahlstedt, who wrote in a recent issue of *Rock Products*, Ytong Co. has several plants under construction outside Sweden. These plants will use different raw materials.

## CUTTING COSTS

### ... Use Natural Energy

In high vacuum systems, you can considerably cut down on steam consumption by taking advantage of seasonal variations in the temperature of condensing water. This is the opinion of V. V. Fondrk of Elliott Co., who spoke at the recent French Lick, Ind., meeting of the AIChE.

Ejector equipment, Fondrk explains, is normally designed for stable operation with maximum expected water temperatures. Stages discharging to intercondensers are designed for a maximum discharge pressure which is higher than the vapor pressure corresponding to maximum water temperature. When colder condensing water is available, correspondingly lower vapor pressures permit operation of the condenser, and thereby the ejector discharge, at lower pressure.

With lower pressure available in the intercondenser, operating steam pressure of the stage discharging to the intercondenser may be reduced. Because steam flow is a direct function of absolute steam pressure, steam flow is reduced. However, oversize secondary ejectors must be provided to handle the lower booster condenser pressure.

How would you determine the possible reduction in steam pressure for a given reduction in water temperature? Slowly reduce steam pressure, says Fondrk, until a bobble is noticed in the suction pressure of the stage under consideration. Then by slowly raising steam pressure until the bobble disappears, you can determine minimum steam pressure.

Where water temperatures reach maximum value for only short periods during the year, you can make a fancy savings by throttling steam pressure. Steam flow may be reduced as much as 40 percent. The savings applies to any condenser serving ejector equipment except, of course, condensers that are vented to the atmosphere.

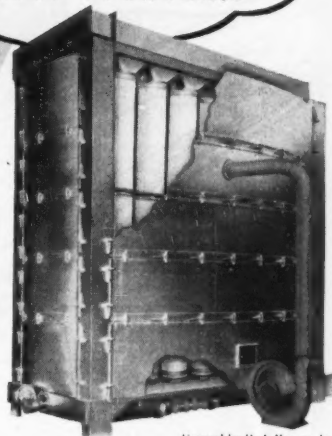
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**This NEW Bulletin  
Will Help You  
Solve Your Dust  
Control Problems**



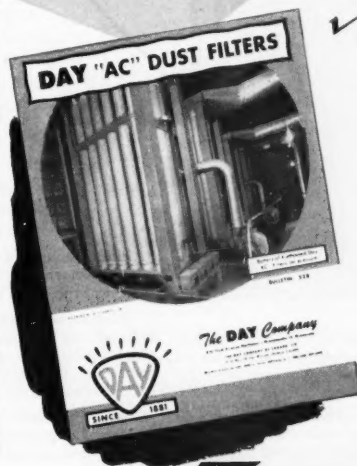
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We've checked only three of the outstanding advantages you get in a DAY "AC" Dust Filter... there are many more especially desirable for handling dust peculiar to the Chemical Industry. That's why we've compiled Bulletin No. 528 which will give you all the facts and figures on the operation of this highly efficient Dust Filter showing why it is so applicable to your industry. The bulletin also shows how DAY engineers can help you toward the solution of any chemical dust problem.

We want you to have the complete story, and a request on your letterhead will bring it to you. Simply ask for Bulletin No. 528 which contains complete detailed information on DAY "AC" Dust Filters, a Dust Problem Analysis Sheet for your convenience in making a dust check in your plant, and information on other DAY air handling and air cleaning equipment.

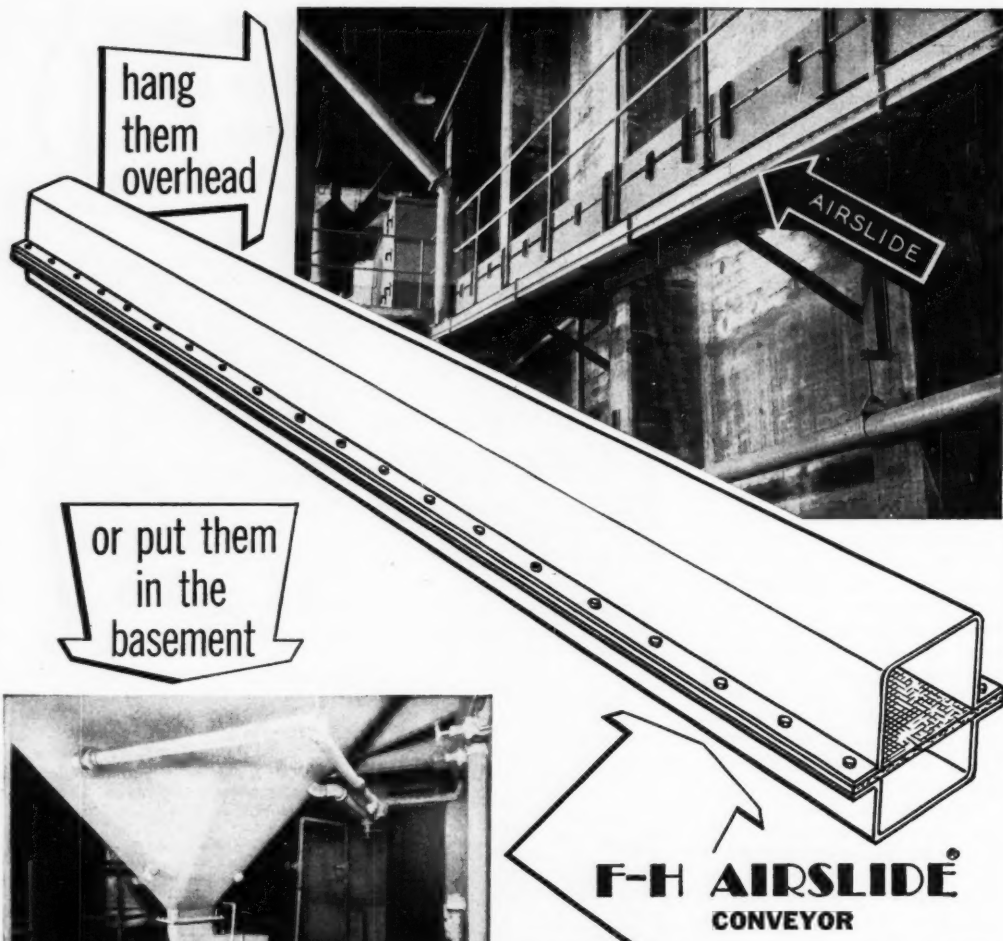
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Airslide operates on the principle of fluidizing dry, fine materials, with low-pressure air, so that they flow by gravity, like water, on a slightly inclined plane.

Photographs shown illustrate two extreme locations. The upper view shows the Airslide, suspended overhead, from a walkway; the other located in a basement.

Airslides will convey materials such as, for example: gypsum, soda ash, fly ash, barytes, bentonite, Portland cement, cement raw material, flour, ground ores, hydrated lime, alumina, catalysts, silica, phosphates, talc, resins, detergents and soap powders, and calcined magnesite.

Why not have a Fuller engineer show you how an F-H Airslide Conveyor system can reduce the cost of conveying dry, fine materials in bulk, while it increases production efficiency. This service costs you nothing and, it may mean a step toward better production, more economically attained.

Among the many worth-while advantages of the F-H Airslide Conveyor is the ease with which it can be designed and installed to avoid structural obstacles and production equipment; allow for much needed, valuable space in the plant.

Airslides permit economy in location without the restrictions or straight-line limitations of mechanical conveyors. Use of alternate straight and curved sections result in almost complete freedom of location, subject only to headroom requirements to allow for the proper degree of slope required for moving the material. The

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FH-25

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# Why CRANE uses *Ni-Resist* to extend valve life

Resembling austenitic stainless steel in many of its characteristics but possessing the wear resistance, machinability and other useful properties of gray iron, **NI-RESIST®** provides a unique combination of properties at moderate cost.

It resists not only corrosive attacks of acids, alkalis and salts, but also provides outstanding resistance to wear in metal-to-metal applications...

For instance, CRANE Ni-Resist gate valves, under corrosive conditions in a starch plant, have outlasted valves of other materials more than 5 times and are still giving perfect service.

Constantly exposed to hydrochloric acid vapors at 50 p.s.i. and 250°F. on raw materials inlet to converters, the valves previously used needed repairs every 2 to 3 weeks... and replacement every 3 to 4 months.

CRANE Ni-Resist gate valves with 18-8 Mo Stainless Steel trim were still in excellent condition after 19 months of uninterrupted service.

CRANE CO., whose products are used throughout the world of industry, and whose name is synonymous with valve quality, has for many years carried a line of Ni-Resist valves as part of its regular stock.

Several types of Ni-Resist are available to meet a variety of industrial demands. Get full information... mail coupon now.

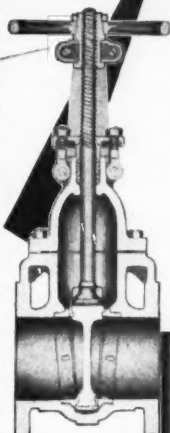
At the present time, the bulk of the nickel produced is being diverted to defense, but

## cut the high cost of corrosion

IN MANY SERVICES...WITH

### CRANE *Ni-Resist*

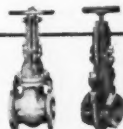
#### CAST IRON GATE VALVES



Cross-section 4 to 8 in. size, bolted bonnet joint, flanged ends.

Here is a line of "cast iron" gate valves with a special talent for resisting corrosion, erosion and wear. Use them with safety where the strength of ordinary cast iron is adequate—in soda and sulfur pulp mill service—on creosote lines in wood treating processes—for handling sour distillates and crudes in petroleum refining—and many similar services.

Due to the extra staying power of Crane Ni-Resist Cast Iron Valves in their make-up (approximately 14% nickel, 24% chromium, and 6% copper)—and in their 18-8 Mo Alloy Steel stem and seating faces. Not to be overlooked is the fine Crane design that gives you a strong body and bonnet without excessive weight, a well-proportioned stem with precision-cut threads, a sturdy yoke, and the dependable disc-stem connection that assures smooth operation and tight seating of the solid wedge disc. Ask your Crane representative for full details, or see your Crane Catalog.



#### THE CRANE NI-RESIST LINE

Working Pressures:  
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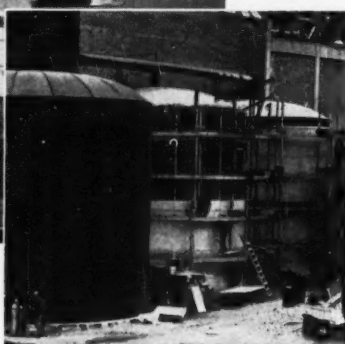
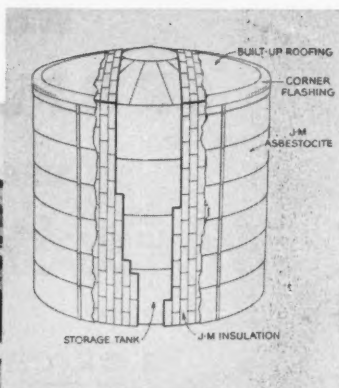
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Cutaway drawing shows how J-M Weather-Protected Insulation is applied to tanks such as those at the S. D. Warren Company paper mill. Standard methods for mechanical securing of the insulation are used. Asbestocite sheets are then applied over the insulation, in accordance with the simplified Johns-Manville specification.



▲ (Above) Completed job of J-M Weather-Protected Insulation on black liquor tanks of the S. D. Warren Company.  
(Right) Skilled applicators of an outstanding J-M Insulation Contractor, P. S. Thorsen Co. of South Boston, Mass., applying Asbestocite sheets over Zerolite insulation.



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# *Chemical Engineer's Bookshelf* Edited by Lester B. Pope

## After 2 Years' Work

**MANAGEMENT CONTROLS IN INDUSTRIAL RESEARCH ORGANIZATIONS.** By Robert N. Anthony and John S. Day. Published by Division of Research, Graduate School of Business Administration, Harvard University, Boston. 538 pages. \$6.75.

Reviewed by Blaine K. McKee

Here is a survey of management control practices now being used in industrial research organizations. It is the latest of the research publications dealing with problems of administration, published by the Harvard Business School. Prof. Anthony is an associate professor of business administration, and John S. Day is a research associate at the Harvard Business School.

Two years were spent in gathering the material presented in this book. The author talked with more than two hundred people working at various levels in industrial research, from research directors to laboratory and machine shop workers. Dr. Anthony also interviewed officials not directly connected with research—controllers, financial executives, presidents, and their assistants—and government officials, university officials, faculty members, and consultants. He also reviewed the more than two thousand books and articles published dealing with the problem of research management. In addition questionnaires were mailed to the 1270 research organizations listed in the National Research Council Directory as employing more than fifteen persons. Dr. Anthony received 446 usable replies, including 405 from industrial and 41 from commercial or consulting laboratories.

Companies have developed controls for most of their activities such as production, finance, or marketing. As yet, however, completely satisfactory controls have not been developed for research. The author realizes that there is a basic contradiction involved in industrial research work: on the one hand, success in research depends to a large degree upon the freedom of the research worker, but, on the other hand, industrial research must be

managed, as it is only one part of the activities of an organization that has finite resources and specific objectives. Dr. Anthony believes that the research worker will more willingly accept rules and regulations if he understands the necessity for them.

The book deals in detail with the controls being used in industrial research. Operations discussed include: planning the technical program, budgeting by organization units, control of the service department, control of procurement and use of equipment, and accounting for and checking up on spending.

In the final section of the book the research organizations of four different companies, varying in size and type, are set forth in detail. Three of these companies are identified. These are Merck & Company, Inc., General Radio Company, and Bell Telephone Laboratories, Inc.

In an appendix the results of the questionnaire answered by 446 companies are given in tabular form.

This book is a serious effort to describe present practices in research organizations and to show the administrative problems involved. The author states that the book was written primarily for those who manage industrial research, but it should also be of interest to all those who work in this field as it will help explain to them the reasons for the many regulations that they think serve only to slow them up. It may also make them more contented with their lot and less ambitious to become executives.

## Bargain of the Month

**ACIDS AND BASES — THEIR QUANTITATIVE BEHAVIOR.** By R. P. Bell. John Wiley and Sons, New York. 90 pages. \$1.50.

Reviewed by F. C. Nachod

There is perhaps no other field in chemistry where so much confusion exists in the minds of chemists and chemical engineers even after a successful passage of exams or after several years of practice, than acid-base concepts. Dr. Bell of Oxford University well known for his publications

on acid-base catalysis has done a fine job of reviewing, reporting, and clarifying so that this reviewer recommends the booklet as "bargain of the month."

## Top Management

**TOP MANAGEMENT ORGANIZATION AND CONTROL.** By Paul Holden, Lounsbury Fish and Hubert Smith. McGraw-Hill Book Co., New York. 257 pages. \$4.

How 31 "blue-chip" and other top companies are run. That's the theme of an excellent and timely study by the Stanford University Graduate School of Business. The book should be of considerable value to chemical executives who are actively concerned with the problem of the organization of management.

Data were obtained by personal discussions with top management groups of the 31 companies, each with average assets of \$260 million. Companies studied were in the following fields: building materials, 4; chemicals, 5; food products, 2; machinery and equipment, 9; non-ferrous metals, 2; petroleum products, 4; rubber, 2; and steel and steel fabricating, 3. Each of these was chosen on a basis of reputation for progressive and enlightened management.

The study defines top management as: (a) the board of directors; (b) general management, consisting of those executives who are concerned with the business as a whole, and (c) divisional management, those executives who are directly responsible for the major departments, divisions, or subsidiaries of the company.

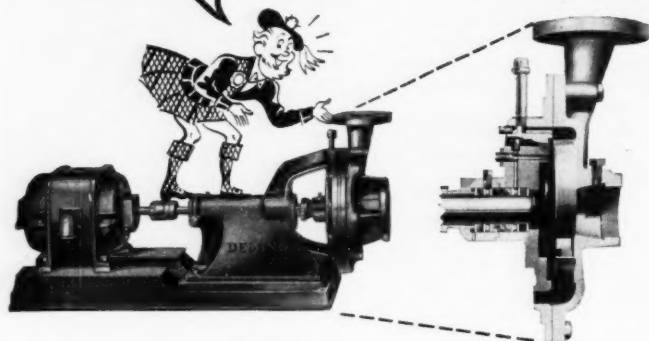
The authors define the primary responsibilities of top management, then proceed to codify the practices of the 31 well-managed companies into "certain definite impressions as to how top management is taking steps to fulfill most effectively its basic functions."

The book's organization is as follows:

1. Far sighted planning and clarification of objectives, visualizing the needs of the business and determining

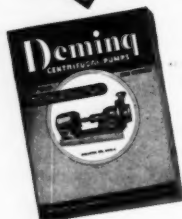
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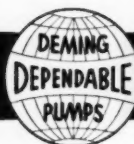
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BOOKSHELF, cont. . .

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## Agriculture Yearbook

**INSECTS.** The Yearbook of Agriculture, 1952. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 780 pages. \$2.50.

Reviewed by G. W. McBride

"How many insects are there?" With this question the 1952 Agriculture Yearbook starts on a fascinating portrayal of the world of the entomologists. Chemical engineers obviously are interested in this question too, perhaps for business reasons, but surely for personal reasons. The common fly graces the cover of the new book in enlarged form and many other insect pests are found attractively portrayed throughout the volume.

An inspiring foreword by Secretary Brannan offers a challenge to the engineers by implication. The chemists and entomologists are on the battle line in this war between men and insects, but the chemical engineers are not far behind.

The new yearbook is designed to be a practical aid both to farmers and to city people in identifying insects, in making best use of the helpful ones, and in controlling the pests that cause an estimated \$4 billion of damage annually. In addition to 72 color plates at the end of the book, there are a number of black and white photographs and more than 200 drawings, exceptionally fine in detail and clarity.

Several chapters discuss insecticides and fumigants and their application. The hazards of pesticides both in

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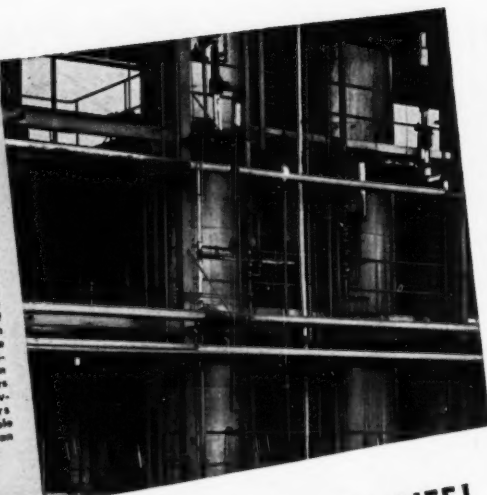



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#### BOOKSHELF, cont. . .

their application and in their residues make up another chapter. Altogether there are 110 articles in the 21 chapters of the Yearbook. More than 800 insects are discussed.

This is a very attractive book which will be a worthy addition to anyone's library, from the standpoint of both looks and reference value. The U. S. Dept. of Agriculture authors and editorial staff seem to have done an exceptionally good job this year.

For those who want an excuse to get acquainted with their congressmen, copies are available for distribution by members of the Senate and House of Representatives. The yearbook is also for sale at the Government Printing Office (orders should not be sent to the U. S. Dept. of Agriculture).

#### In One Spectral Range

ULTRAVIOLET RADIATION. By Lewis R. Koller. John Wiley and Sons, New York. 270 pages. \$6.50.

Reviewed by F. C. Nachod

A book in which many aspects of ultraviolet radiation are brought together in a clear and lucid fashion has been awaited for quite sometime. Dr. Koller has done the task well in covering radiation sources, transmission and reflection properties of various materials, application and effects of ultraviolet radiation and detecting devices. The book is not intended to be all-inclusive but will serve as a valuable guide to those who are concerned with some phase of experimental work involving this spectral range.

#### Unusual

ENGINEERS AND IVORY TOWERS. By Hardy Cross. McGraw-Hill Book Co., New York. 141 pages. \$3.

Reviewed by B. K. McKee

"Engineers and Ivory Towers" by Hardy Cross is a series of informal essays on the subject of engineering and engineering education which give the author's views as gained in over thirty years' experience as an engineer and as a teacher of engineers. The essays presented in this book were collected and edited by Robert C. Goodpasture. The original material



existed in magazine articles, society papers, transcribed speeches, longhand classroom notes, and graduate lectures.

Hardy Cross is an outstanding civil engineer and teacher. The "Hardy Cross System" of analysis represents one of the significant advances in the field of structural engineering. In 1944 he received the Lamme Medal given by the American Society for Engineering Education for his achievements both as an engineer and an educator. Yet Hardy Cross first taught English upon graduating at the age of seventeen from a small liberal arts college. After a brief career as an English instructor at Hampden-Sydney College and Norfolk Academy, he returned to school and took undergraduate and graduate work in civil engineering. At present he is the Strathecona Professor of Civil Engineering at Yale.

In his book Hardy Cross discusses engineering education and engineering in all its phases including its value, its responsibilities, and its limitations. His view of the engineer's place in American life is a high one. He defines the purpose of engineering as service to mankind. He denies that the engineer is a narrow man, but believes that the engineer is a man of true culture. He writes: "If culture represents realization, appreciation and enjoyment of the fullness of life, of all the material, mental, aesthetic and spiritual factors that make up this world of men, engineers are in a peculiarly favorable position to achieve it. If they enter fully into the science and the humanities involved in adapting natural forces to the use and convenience of man—well, that is culture; then engineers live it and make it."

About engineering education and education in general, Cross writes with the benefit of his years of experience. The purpose of education, he believes, is to prepare a man to live a full life. He does not believe that a student becomes broad merely by taking courses in sociology, economics, history, psychology and literature. He believes these courses only are of value if an interest in them has first been aroused in the student. And, although Cross admits the man who makes two blades of grass grow when only one grew before his worthy of admiration, he questions whether the teacher who sets up two courses where one grew before is always worthy of praise. He feels that inflation in edu-

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### BOOKSHELF, cont. . .

cation is as undesirable as in everyday life.

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one of his essays, he discusses the quaint and beautiful bridges of the world, bridges that harmonize completely with their settings. Bridges to Cross are not just formulas, but are studies in light and shadow.

"Engineers and Ivory Towers" by Hardy Cross is a most unusual and interesting book, which reveals a most unusual and interesting man.

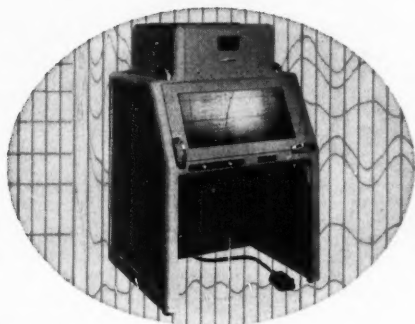
## Recent Books & Pamphlets

Subject	Summary	How to Order
Synthetic Organics	Annual summary on U. S. production and sales. Covers 1951. 180 pages.	Tariff Commission, Report 175. Supt. of Documents, Washington 25, D. C. 45 cents.
Protective Coating	The development and use of methods for evaluating the relationship between the depth of the surface profile of grit- or sand-blasted metal surfaces and the required film thickness for a protective coating system. 3 pages.	"New Standard for Coating Thickness." Office of Information Services, New York University College of Engineering, New York 53, N. Y. 10 cents.
Air Cleaning	Current information on air cleaning methods and their effectiveness. Ventilation and removal of gaseous contaminants are not discussed. Prepared by the AEC. 90 pages.	"Handbook on Air Cleaning - Particulate Removal." Supt. of Documents, Washington 25, D. C. 45 cents.
Liquid Metals	Reference information on liquid metals as heat transfer media. The handbook was sponsored by the Navy Dept. in collaboration with AEC. 270 pages.	"Liquid-Metals Handbook." Second edition. Supt. of Documents, Washington 25, D. C. \$1.
Fire Prevention	Report on fundamental studies of chemical retardants for the fire resistant treatment of textiles. 308 pages.	PB 111007. Office of Technical Services, Dept. of Commerce, Washington 25, D. C. \$7.75.
Antifreezes	Practical information and advice on engine cooling system antifreezes and corrosion inhibitors. Other cooling system service products, such as cleaning compounds and stop-leaks, are also discussed. 16 pages.	"Selection and Use of Engine Antifreezes." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 40 cents.
Pharmaceuticals	List of the magazine holdings of 25 pharmaceutical libraries in the U. S. and Canada. Periodicals in the fields of business and manufacturing as well as many government documents are covered. Mimeographed.	"Union List of Periodicals in Pharmaceutical Libraries." c/o Helen Loftus, Lilly Research Laboratories, Indianapolis 6, Ind. \$3.
Labor Relations	Catalog of most of the films, filmstrips, recordings and transcriptions in the field of industrial and labor relations made in the last ten years. 46 pages.	"A Guide to Audio-Visual Materials." By J. J. Jehring. Distribution Center, School of Industrial and Labor Relations, Cornell University, Ithaca, N. Y. 25 cents.
Welding	Latest specifications for filler metal. Covers copper and copper-alloy welding rods for use with oxy-acetylene, carbon arc and inert-gas metal-arc (nonconsumable electrode) welding. 13 pages.	Designation B 259-52 T. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 40 cents.

(Continued)

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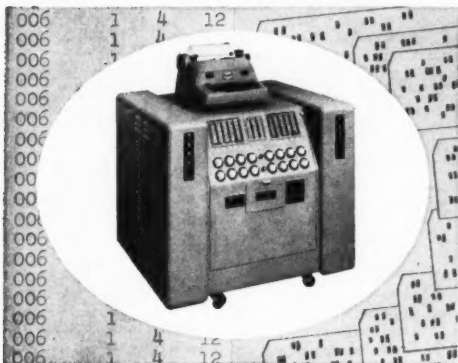
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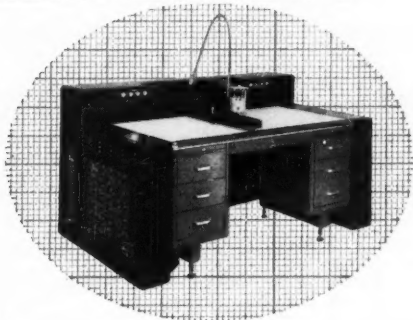
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## RECENT BOOKS AND PAMPHLETS, cont. . .

Subject	Summary	How to Order
Natural Gas	Report on studies to improve the substitutability of oil gases for natural gas by modifying their compositions in one of three ways: by mixing or dilution with inerts; by reduction or removal of specific aromatic hydrocarbons through scrubbing, freezing or compression; by control of severity of cracking in the production of oil gases. 28 pages.	"Interchangeability of Oil Gas and Natural Gas." By D. L. Nicol, R. A. Brown and H. R. Linden. Institute of Gas Technology, 17 West 34th St., Technology Center, Chicago 16, Ill. \$2.50.
Food Chemistry	A new biweekly journal to cover all phases of food production and processing as well as chemical developments designed to expand yields of crops required in the manufacture of many industrial products and articles of clothing and shelter. It will make its first appearance in April, 1953.	"Agricultural and Food Chemistry." American Chemical Society, 60 East 42nd St., New York 17, N. Y.
Dust Control	Factors influencing the quantity of solids in stack gases are reviewed. Suggestions that will aid in lower cinder and fly ash emission are discussed. Particular attention is given to the smaller plants up to about 300 boiler hp. 12 pages.	"How to Reduce Stack Dust from Small Stationary Plants." Bituminous Coal Research, Inc., 2609 First National Bank Bldg., Pittsburgh 22, Pa. 40 cents.
Dust Control	Control of metallurgical and mineral dusts and fumes in Los Angeles County, Calif. Liberally illustrated with maps, photographs and tables. 79 pages.	Information Circular 7627. By Glenn L. Allen, Floyd H. Viets, and Louis C. McCabe. Bureau of Mines, Washington 25, D. C.
Distilled Spirits	Statistics on distilled spirits and rectified spirits and wines for the fiscal year ended June 30, 1952. Production and consumption broken down by kinds of spirits and by states. 27 pages.	Treasury Dept., Bureau of Internal Revenue, Alcohol and Tobacco Tax Div., Washington, D. C.
Fused Salts	Tabular and graphical data recording the results of an investigation on the conductivity and density of various mixtures of fused chlorides. 14 pages.	RI 4858. Bureau of Mines, Pittsburgh 13, Pa. Gratis.
Air Pollution	An extensive bibliography covering causes, effects, control and abatement methods. 57 pages.	"Air Pollution Abatement Manual, Chapter 12." Manufacturing Chemists' Assn., 15th and H Sts., Washington 5, D. C. 50 cents.
Ammonium Dichromate	Safe handling and use. Important physical and chemical properties, health hazards and their control, personal protective equipment. 12 pages.	Chemical Safety Data Sheet SD-45. Manufacturing Chemists' Assn., 15th and H Sts., Washington 5, D. C. 25 cents.
Western Resources	Compilation of economic and technical data on the eleven Western States. Reserves, capacity, production, consumption, processing plants and geographical location with respect to each material, product or industry. Primarily tables, charts and maps with a minimum of text. Loose-leaf.	"Western Resources Handbook." Stanford Research Institute, Stanford, Calif. \$2.50.
Safety	List of approved respiratory protective devices. Photographs. 15 pages.	Information Circular 7636. By S. J. Pearce and L. B. Berger. Bureau of Mines, Washington, D. C. —End

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...is finding wide success as an individual coffee bag due to its many fine features

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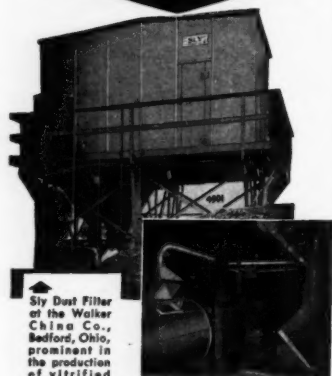
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## CE's Guide to

## NEW TECHNICAL LITERATURE

### What's New In . . .

### How To . . .

### Company . . .

#### Liquefied Gases

are produced. . . handle and store. How they are produced. Describes a high field strength electromagnet.

Arthur D. Little, Inc., Memorial Dr. at Kendall Sq., Cambridge 42, Mass.

#### Plant Layout

type of equipment for plant layout purposes. Four layout methods are described, cost and intangible advantages determined and compared. 16 p.

"Visual" Planning Equipment Co., Pennsylvania Ave. at River, Oakmont, Pa.

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make the best use of a new line of cast steel gate valves. Tabulated details of design, material specifications, pressure and temperature ratings, dimensions and weights. 6 p.

Edward Valves, Inc., East Chicago, Ind.

#### Water Conditioning

caused through industrial water contamination. Recommendations for water conditioning treatments for scale, sludge, corrosion, carryover and other boiler conditions. 12 p.

E. F. Drew & Co., 15 East 26th St., New York 10, N. Y.

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new plant that will offer the best combination of factors affecting total production cost. Question and answer format. 12 p.

Walter Kidde Constructors, Inc., 140 Cedar St., New York 6, N. Y.

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handle most ordinary pumping jobs requiring capacities up to 700 gpm. and heads as high as 135 ft. with a line of frame type centrifugals. Cross section diagrams. 4 p.

Allis-Chalmers Mfg. Co., 1147 South 70th St., Milwaukee, Wis.

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protect property and production against explosive liquids, dusts or vapors with fan-cooled explosion-proof motors. Pictures a variety of types and sizes. 12 p.

Louis Allis Co., 50 Church St., Milwaukee 7, Wis.

#### Electric Eyes

use them in the process industries. Describes installations that have been made for instant and accurate monitoring of process flows. 2 p.

Ess Instrument Co., 96 South Washington Ave., Bergenfield, N. J.

#### Adhesive

bond natural, GRS, neoprene and nitrile rubber compounds to iron, steel, aluminum and other metals. Test data on non-corrosive solvent-resistant bonding agent. 8 p.

General Tire & Rubber Co., 1704 Englewood Ave., Akron 9, Ohio.

#### Equipment

evaluate the products and services of this manufacturer of equipment, mostly for crushing and grinding. Hard-covered book briefly covers company's 50-year history, its current management, facilities, products. 70 p.

Traylor Engineering & Mfg. Co., Allentown, Pa.

#### Compressors

choose the right single stage centrifugal compressor for your specific requirements. Functions, applications, ratings, features of design, arrangements and methods of control. 12 p.

American Blower Corp., Detroit 32, Mich.

#### Instruments

the use of a new continuous support. Photographs and diagrams.

T. J. Cope, Inc., 711 South 50th St., Philadelphia 43, Pa.

#### Chemicals

supply your plant with hydrocarbons and aliphatic sulphur chemicals. Listing covers price and shipping information on those made by this company. 12 p.

Phillips Petroleum Co., Bartlesville, Okla.

#### Fork Trucks

electric fork trucks made by various manufacturers. Chart lists points that should be compared. 4 p.

Lewis - Shepard Products, Inc., Dept. R-1, Watertown, Mass.

#### Motors

make use of the modern design features of vertical motors for deep well turbine pumps. Drawings of individual features in full color. 16 p.

McCarty Co., 1206 Maple Ave., Los Angeles 15, Calif.

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Electric Machinery Mfg. Co., Minneapolis 13, Minn.

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Podbielniak, Inc., 341 East Ohio St., Chicago 11, Ill.

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Harshaw Chemical Co., 1945 East 97th St., Cleveland 6, Ohio.

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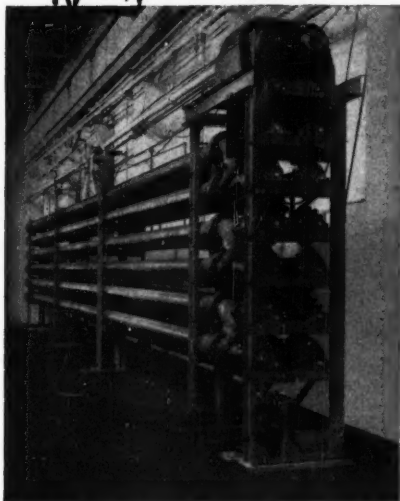
Irvington Varnish and Insulator Co., 6 Argyle Terrace, Irvington, N. J.

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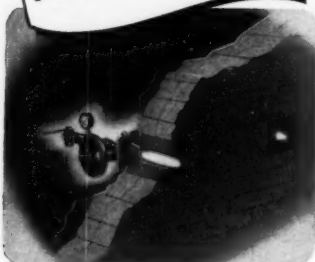
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Instruments	. . . study a wide variety of electrical and mechanical phenomena through the use of direct-writing recorders. 16 p.	Sanborn Co., 38 Osborne St., Cambridge, Mass.
Solvents	. . . rate the relative toxicity hazard of solvents. Application of this firm's orthosene, petrolene and frigisol.	John B. Moore Corp., P.O. Box 3, Nutley 10, N. J.
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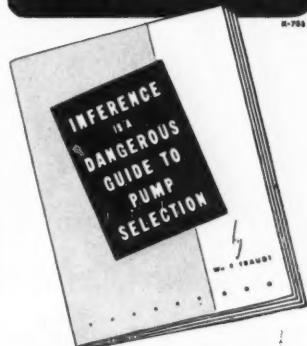
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(Continued)

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BULLETIN S-146 AVAILABLE

Fault-filled enthusiasms for certain types of pumps now running rampant in industry, are dangerous. Because a type of pump performs sensationally on somebody else's job, it isn't necessarily certified for your use.

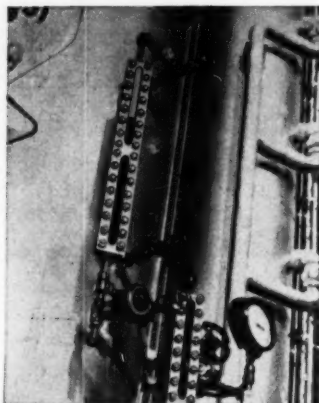
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### What's New In . . .

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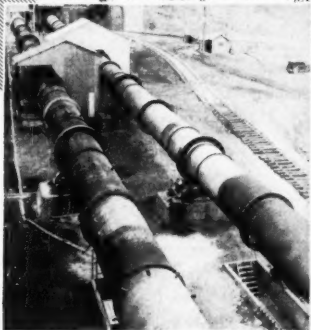
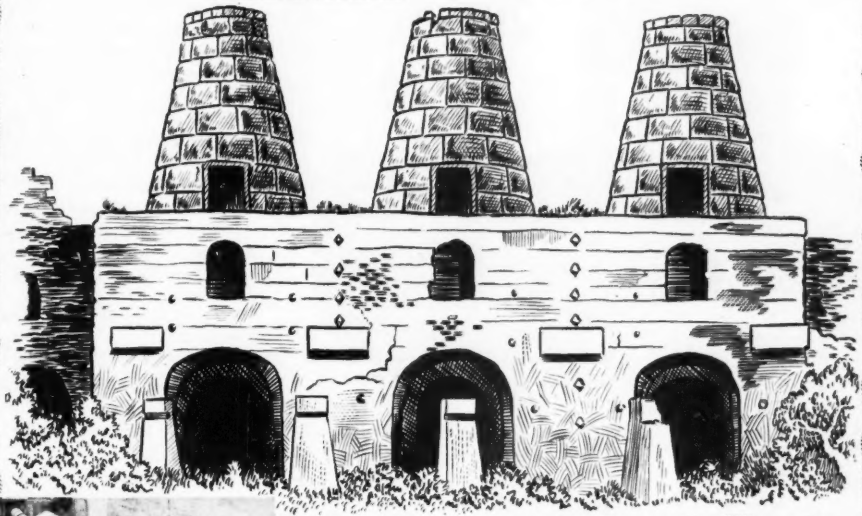
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*in this 1888 cement plant now lies in ruins. Each kiln produced only 100 barrels of clinker weekly . . . was soon made obsolete by the rotary kiln with its continuous production.*



**In meeting the needs** of the chemical processing industry for 50 years, Traylor engineers have developed equipment to realize the greatest efficiency from new methods of production. It is this experience, built into every Traylor machine, that assures dependable production of a uniform, high-quality product. Depend on experience to relieve your production worries. Depend on Traylor experience . . . half a century of it.

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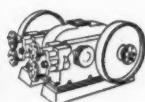
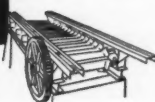
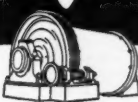
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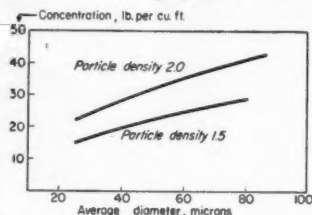
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### CATALYSTS

Continued from page 149

a gradual wearing down of large particles through minor chipping at the surface. Fines produced by attrition affect circulation rates and fluidization performance just as fines in fresh catalyst do. It is true that excessive attrition would result in higher catalyst usage. But excessive attrition resistance would mean increased erosion of equipment, accumulation of older, less active catalyst, and possibly, a higher fresh fines requirement for satisfactory circulation.

We mentioned before that catalyst particle size also has a bearing on catalyst concentration or bed density. Here again, the effect is usually considered in terms of average particle size. In



the graph above note that catalyst concentration is affected by varying particle density. Generally, fluid cracking catalysts are limited to the particle density range of 1.3 to 1.8 g. per cc. Used catalyst generally falls near the upper limit of this range. Under conditions of constant particle density (the usual situation in a commercial unit) accumulation of coarse material in the unit is accompanied by a rise in the catalyst concentration. Rising and falling bed concentrations are fairly common on the list of variations in commercial operation, and are known to affect operating performance.

Firstly, a number of cracking units are subject to load limitations that impose a ceiling on the weight of catalyst that can be carried and circulated in the unit. Under such conditions, a coarse catalyst occupies a smaller volume than a fine catalyst with the result that bed heights and contact times are limiting factors on the performance and capacity of the unit. Even in cases where load limitations do not exist, operators have observed the increased efficiency of combustion air which goes hand in hand with higher bed levels in the regenera-

tor. Consequently, they've adjusted the equilibrium particle size to give minimum bed height consistent with reasonable catalyst loss.

Next, we'd like to mention that certain operators have observed an effect of concentration on stripping efficiency. It is difficult to generalize in this case since the stripper designs are subject to wide variation. However, most strippers operate at peak efficiency when there is a maximum amount of mixing and turbulence between the steam vapors and the catalyst particles. In addition, a certain minimum steam rate is required for optimum stripping performance. In such cases, if the average particle size is too small, the bed concentration in the stripping section may not be enough to maintain the desired rate of flow against the rising current of steam. Correcting this condition by decreasing the flow of steam may at times result in excessive carry-over of hydrocarbons to the regenerator, resulting in an extra burning load and possibly a reduced capacity. If this is true, the alternate solution would be increasing the average particle size of the catalyst to increase the bed concentration and avoid cutting back on the volume of stripping steam. In this case, a cat cracker operator may find himself required to pick an average particle size giving him a regenerator catalyst concentration greater than he would like to have. This, in order to obtain his best operation through a certain minimum concentration in the stripping section.

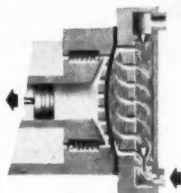
Other conditions that are related to average particle size by way of catalyst concentration are slide valve erosion, transfer line erosion, and equipment vibration. All of these effects can be increased if particle size is too great.

Recognizing the harmful effects of accumulated coarse material in their cracking units, certain refiners have developed or adopted ways and means of removing from the unit inventory the excessively coarse or excessively dense and coarse catalyst particles. The usual way to do this is to withdraw a continuous or intermittent stream of regenerated catalyst from the unit and pass it through a classifier. The fine or light stream from the classifier is returned to the unit while the coarse or heavy fraction is discarded. Use of the tabling method for this application has been described in the literature.<sup>1</sup> (Continued)

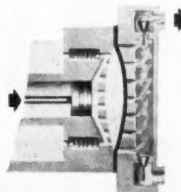
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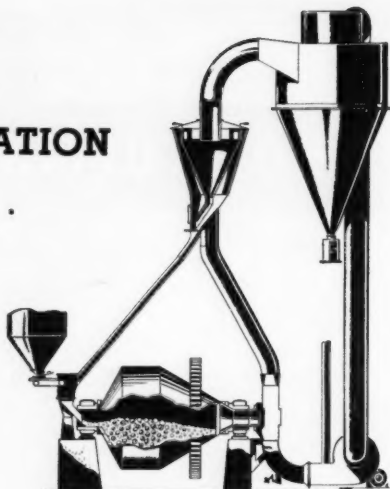
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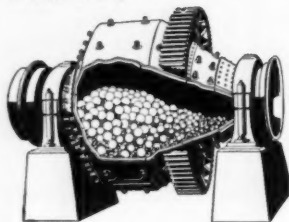
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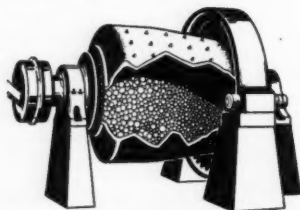
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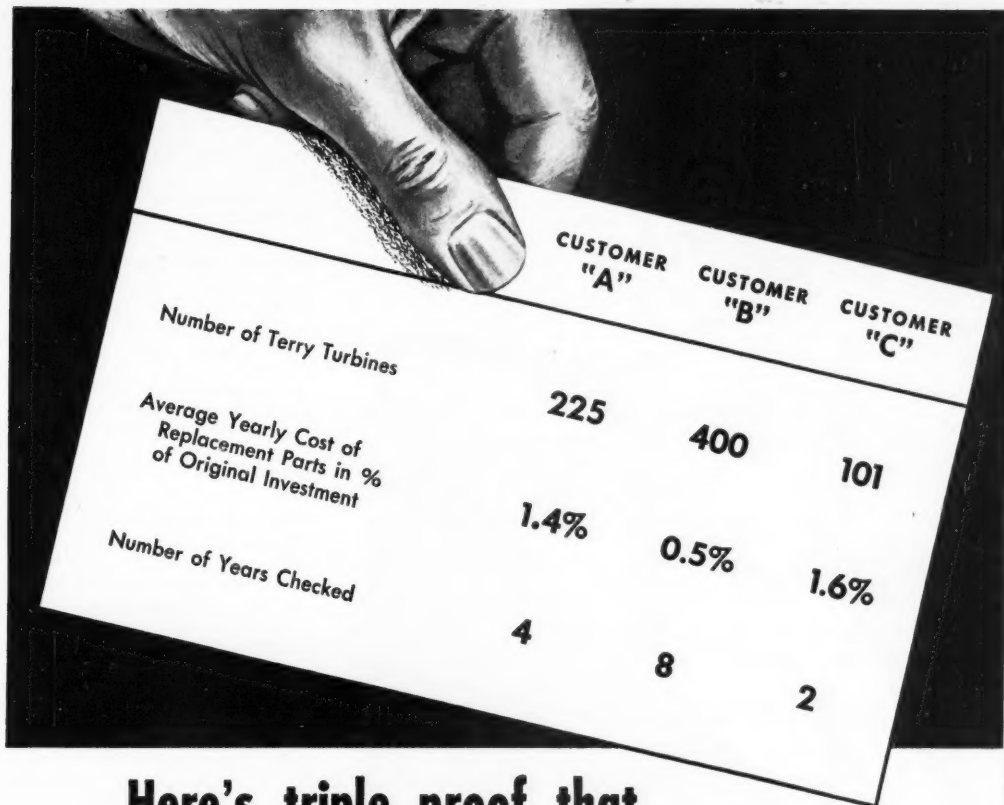
## CATALYSTS, cont. . .

The subject of catalyst losses in relation to particle size is rather complex, and certainly it is not completely understood at this time. However, one of the first things studies in this area proved was that a fluidized bed will remain relatively intact in a gas stream whose linear velocity and viscosity are such that, according to Stokes Law, almost any individual catalyst particle would be carried out of the vessel by the stream of gas. It was, therefore, apparent that some other factors were controlling the disposition of the catalyst particles. At the present time this phenomenon has not yet been explained to the satisfaction of many, and it is perhaps best to say that the particles in a fluidized bed tend to behave as aggregates.

The effects of particle size on catalyst losses are several.

For one thing, a lower average particle size results in a lower bed concentration, as previously mentioned. This has the effect of increasing the bed height and frequently helps contacting efficiency between gas and catalyst. However, disengaging height is reduced as the dense phase rises, and the result may be an increase in cyclone loading. It's common to hear of a critical minimum disengaging height of 15 feet, which would indicate a rise in cyclone loading, and possibly losses, accompanying decreasing catalyst particle size in a bed whose disengaging height is in the vicinity of 15 feet.

On occasion it has been found in commercial practice that catalyst losses were reduced through the addition of finer catalyst to the unit. While it is possible that other factors were contributing, there is a really simple explanation for this occurrence if we recall laboratory fluidization experiments and the excessive slugging or surging action of a coarse catalyst bed. At irregular intervals, the surface of the dense phase is lifted high into the gas stream by large bubbles, and when the bubbles break through there is a mild explosion due to the built-up pressure. Addition of catalyst fines to the bed corrects this bouncing action, and causes a smoother flow of smaller gas bubbles through the bed. At the same time, the dense phase surface moves up and down far less than before, and gas velocities and pressures likewise vary far less than during the slugging period. So it is entirely logi-



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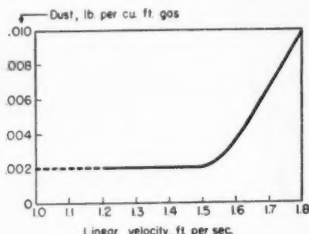


Weights  
less than  
an ounce!

**CATALYSTS, cont. . .**

cal to surmise that when commercial catalyst beds are suffering from a lack of fine catalyst, the fluidization can be improved and the entrainment losses can be reduced by adding finer catalyst.

Normally, we might conclude that the commercial regenerator bed is well fluidized, and has a satisfactory particle size distribution. Well then, what about loss of fines from the bed, through elutriation? Some data on fines content of dense phase versus fines content of dilute phase are avail-



able as shown in the accompanying graph, showing a definite classifying action. Another case has shown that where the equilibrium circulating catalyst consisted of approximately 20 percent minus 20 microns and 50 percent plus 40 microns, the catalyst entering the cyclones contained about half as much plus 40 microns and twice as much minus 20 microns.

Since cyclone equipment characteristically shows decreasing efficiency with decreasing particle diameter, the cyclones represent a second classification step. A further step is involved in the case of units equipped with Cottrell precipitators, where the efficiency of collection will decrease with rising dust loading under constant gas flow conditions.

Assuming that a unit is fluidizing properly, catalyst losses will definitely relate back to the particle size distribution of fresh catalyst, but the approximate nature of this relationship can only be constructed from data collected at the unit. These data include the efficiency of the catalyst recovery equipment, the rate of gas flow, and the disengaging height.

Before leaving the subject, attention should be drawn to the fact that high carbon content gives rise to increased entrainment. If we support the theory of aggregation in order to explain why Stokes Law does not apply to particles in a fluid bed, it is

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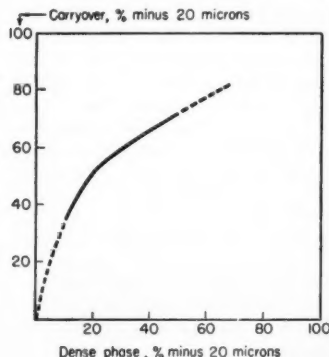
possible that coke deposits have some thing to do with the cohering tendency of fine particles in the regenerator. In any case, there is evidence to show that recovered fines and flue gas samples contain considerably more carbon than the beds from which they have escaped, and that there is a carbon ceiling for regenerated catalyst which is related to entrainment.

In the above discussion on the relationship of particle size to utilization, we must recognize that the cat cracking operator has to consider the magnitude of several different effects before he is able to arrive at the optimum distribution for his particular unit. This optimum distribution will often be a compromise.

## 2. Rugged Operating Eats Up Catalyst Fast

Another major consideration related to the best use of catalyst is the set of operating conditions under which the catalyst is used. For instance:

Cracking through-put has an influence for several reasons. Among them is the fact that higher through-puts mean higher linear velocities in the reactor and regenerator. There is a critical point or break point in the curve relating catalyst carry-over to linear velocity. Generally this curve shows that a constant quantity of catalyst is carried by each cubic foot of gas up to the critical point. Beyond the critical point each cubic foot of gas will carry an increasing quantity of catalyst, as shown in the graph.



Also to be mentioned is the fact that increased through-puts sometimes mean less desirable components in the catalytic feed stock. If this gives rise to increased contamination in the over-all feed stock, catalyst utilization is likely to be affected. When higher

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### CATALYSTS, cont. . .

through-puts involve greater linear velocities in the transfer lines, we have to anticipate both increased erosion of equipment and increased production of fines due to the attrition that is taking place.

A second operating factor is control of vessel pressures. Instances have been observed where erosion of restriction orifices used to control the pressure in the regenerator have resulted in decreased regenerator pressure at the same combustion load. When this happened, it was noted that the higher linear velocities resulted in greater catalyst losses. High catalyst losses have also been known to result from excessive use of spray water in the regenerator, resulting in increased linear velocity.

Another factor is the performance of feed preparation equipment. Faulty operations resulting in inclusion of heavy metal contaminants through entrainment or other means will reflect in poor yield structure.

There can be no doubt that the frequency and severity of after-burning will have an effect on catalyst utilization. This effect could be two-fold, indirectly through damage to the catalyst recovery equipment, and directly through thermal deactivation of the catalyst.

Another factor in operations affecting catalyst utilization is the rate at which catalyst is added to the unit. Although there is still considerable controversy as to the best way to accomplish catalyst additions, it is believed that continuous or relatively continuous addition is preferable to slugging the unit with a large quantity of catalyst in a brief time.

Some units that are not equipped with preheaters have found themselves limited in their ability to carry sufficient heat to the reactors. In such cases, the use of torch oil in the regenerator produces an extra amount of heat. This procedure demands the exercise of caution in order that contaminants present in the torch oil will not deactivate the catalyst or affect its selectivity.

Good insurance for optimum catalyst utilization is also available to the cat cracker operator through a periodic check on the nature of his equilibrium catalyst, and the composition of the feed stock. Careful attention through routine check can sometimes head off serious trouble.

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CATALYSTS, cont. . .

### 3. Catalyst Purity, Structure Determine Life and Efficiency

Although there is a tendency to regard silica alumina cracking catalyst as a rather simple chemical product, those who are familiar with catalyst development and manufacture readily appreciate that control of quality is a complex matter.

In the first place, application studies in the commercial cracking unit require that the finished catalyst have a maximum of chemical purity. This means the exclusion of alkali metals, iron, sulphur, and the so-called heavy metals. The effects of these impurities are generally known to the industry.

A proper pore structure is important too, if a catalyst is to work well.\* Catalytic activity defined by relative space velocity for a given conversion is usually proportional to surface area. Higher pore volume for a given surface area would be expected to give higher catalyst stability because of greater resistance to sintering. Large pore diameters would be expected to favor increased ease of regeneration, due to the ease with which gases can enter and leave the catalyst pores. It is also reasonable to expect that large hydrocarbon molecules would have difficulty in penetrating low pore diameter catalysts, which would lead to greater dry gas yields through selective cracking of the lighter molecules. It has also been demonstrated that the pore volume of the catalyst has an influence on stability. This is shown by steam stability tests on catalysts with varying pore volumes. These tests have shown an increase in steam stability accompanying an increase in pore volume. The attrition resistance of catalyst is inversely related to pore volume. Whereas greater attrition resistance has been observed to result in greater erosion and a deficiency of fines in a circulating catalyst bed, insufficient attrition resistance can result in high catalyst losses. Therefore, there are several reasons requiring the catalyst manufacturer to operate under carefully maintained conditions so as to keep steady control over the pore structure of the catalyst.

Since catalyst particle size plays such an important role in the successful operation of a cat cracker, the manufacturer of catalyst must exercise good control over the particle size of his production. Shipments of



the same particle size grade must remain uniform over long and short periods of time in order that the customer might be assured uniform performance of the FCC unit.

In viewing catalyst properties, therefore, one recognizes the responsibility of the supplier to provide a uniform, high-quality product to the cat cracker operator.

#### 4. Catalyst Control Has Influenced Better Unit Designs

During the development of the fluid catalytic cracking process from 1939 to the present day, a great many modifications in plant designs have been carried out with the objective of reducing initial investment, simplifying operations, and reducing maintenance problems. These design changes have been made possible by the elimination of some equipment, a reduction in safety factors that were found by experiment to be unnecessary, and recognition of the importance of catalyst properties, especially particle size distribution, on plant design. Though the designs of modern units do not resemble the original fluid unit in many respects, the basic principles are still the same and the major changes have been simplifications toward reduction of initial investment and operating costs. The major problems of proper fluidization of catalyst recovery are the same in the old and the new designs.

The first of the wartime FCC units had the circulating catalyst entering the bottom of the reactor and the regenerator and leaving with the overhead gases. The recovery system consisted of three stages of cyclone separators in the overhead lines leaving both vessels, and a Cottrell precipitator on the flue gases leaving the system. It was next found that if the reaction vessels were designed for low superficial gas velocities, and if sufficient disengaging height was provided above the fluid bed, a large portion of the catalyst could be recovered by hindered settling, permitting the elimination of two stages of cyclones. The regenerator was elevated and the reactor placed below the regenerator. In this manner it was possible to operate the regenerator at lower pressures. The catalyst recovery equipment in this design consisted of a single stage of cyclones in both reactor and regenerator with a Cottrell on the flue gases. On the oil side, the catalyst was scrubbed out by a circulating oil

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CATALYSTS, cont. . .

system. Later, design improved to the point where it was possible to balance the pressures on the reactor and the regenerator, and both vessels could be supported at the same level, permitting a marked saving in structural steel and piping costs. Pressurized regenerators improved catalyst recovery to the point where Cottrell precipitators were no longer required if two stages of cyclone separators were used.

The sum of the above modifications led to the design of a new type of FCC unit, generally called the single tower type, most aptly suited for units with capacities of 12,000 barrels per day and below. The ultimate in this latter type of design incorporates the regenerator and reactor as an integral part with internal standpipes and carrier lines. Two stages of cyclones are mounted internally in the regenerator and there is no need for a Cottrell precipitator. The theory behind this design is to realize some saving in vessel diameter and structure weight partly by increasing the superficial gas velocity without any appreciable increase in catalyst loss.

It might be thought that a further simplification could be realized by employing only hindered settling and a single stage of cyclones. However, it has been proved commercially that the second stage is required even though the catalyst size is being carefully controlled. This is brought about by the fact that the attrition is continually taking place and a certain amount of fines are required in the system to maintain good fluidization characteristics.

It is unlikely that any fluid catalytic cracking units will be designed for complete catalyst recovery since the catalyst cost savings would not justify the more expensive catalyst recovery equipment. Furthermore, in the catalytic cracking process it is normally necessary to have some make-up of fresh catalyst in order to maintain catalyst activity and selectivity at the proper level. However, if new catalysts with price tags significantly above the present levels should be developed, a more complete recovery system could probably be justified.

#### REFERENCES

1. Villand, C. K., *Oil and Gas Journal*, 49, No. 30, 1950.
2. Ashley, K. D. and Innes, W. B., "Control of Physical Structure of Silica Alumina Catalysts," presented before the American Chemical Society, Sept., 1951.



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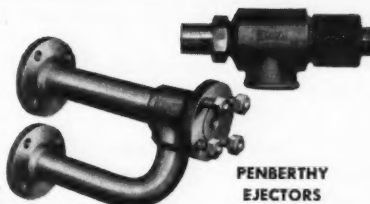
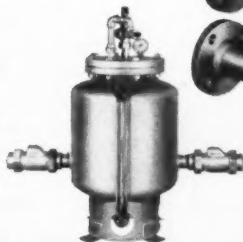
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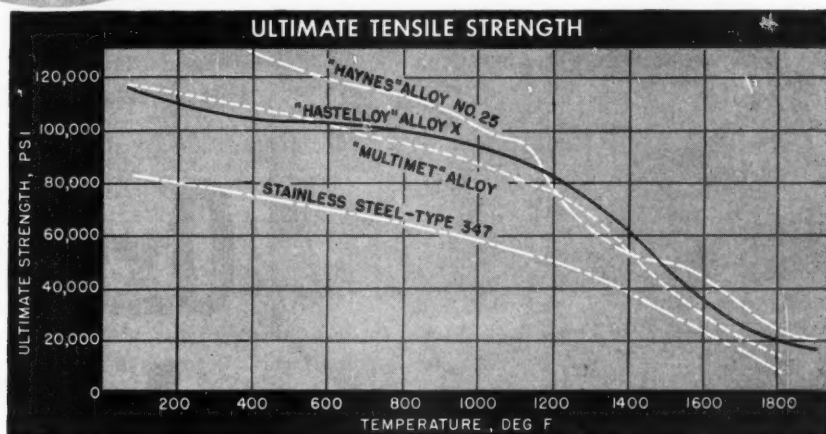




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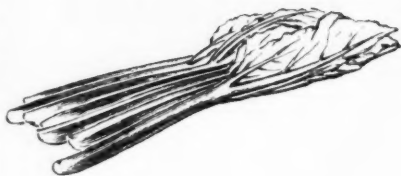
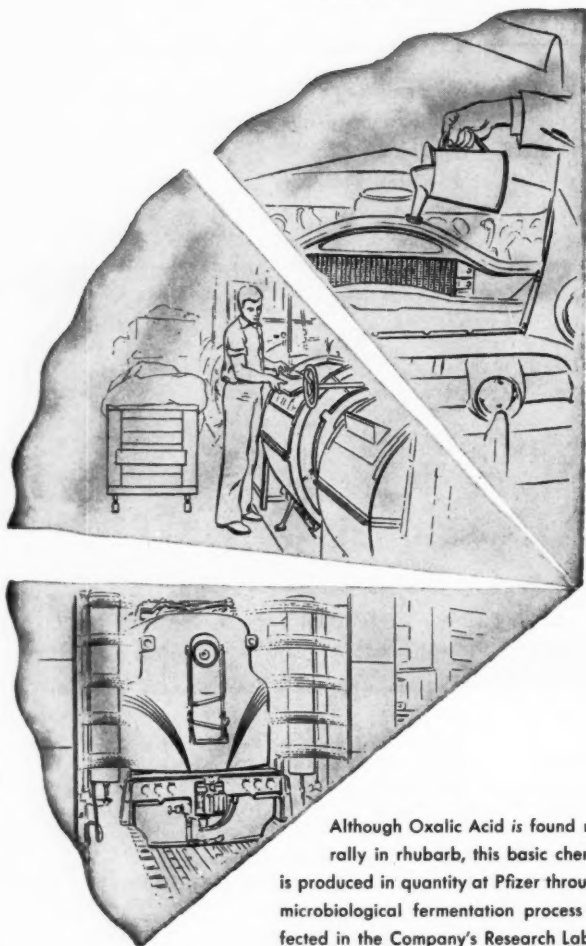


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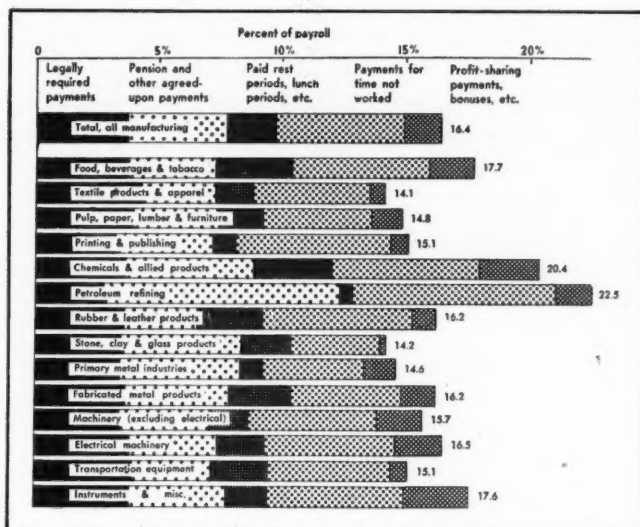
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# PFIZER





## Leaders in Fringe Benefits

**Chemical and petroleum refining lead all manufacturing industries in the payment of fringe benefits: over 20 percent of their payrolls.**

Despite all the publicity surrounding the fringe benefits won in steel and coal, it's chemicals and the process industries that still lead the parade.

Weekly wages and hourly rates of pay no longer measure employee income or the labor cost of operating a firm. In recent years, pensions, insurance programs, paid vacations, bonuses, social security and other benefits have become an important economic factor. These so-called fringes give employees additional compensation for each hour on the job. They also increase the employers' cost for each hour of labor that is productive.

Practically all groups—public and private—which collect wage data overlook these important non-wage payments. Fortunately, the Economic Research Department of the Chamber of Commerce has—since 1948—filled this statistical void. Their latest study covering the extent of fringe

benefits in 1951 has just been released.

► **Big Picture**—According to the findings, the average company had fringe obligations amounting to 18.7 percent of its payroll. The average employee receives \$644 a year in non-wage benefits.

About one-third of all fringes come in the form of payments for time not worked. This includes paid vacations, holidays, and paid sick leave. Somewhat less than a third is composed of employer contributions to pension funds and insurance programs. And the balance of the fringe is pieced together from industry payments under social security, profit-sharing payments and paid rest periods.

Highest payments are made in the West and Northeast. Somewhat lower benefits are available to employees in the East North Central and South Eastern States.

The survey reveals that there is no relation between the size of the firm

and the amount of fringe benefits. Fringes vary with industry, not size of plant.

► **Payments in CPI**—Petroleum refining and chemicals and allied products lead the chemical process industries as well as all manufacturing industries with fringes amounting to 22.5 percent and 20.4 percent of their payrolls (see cut). In petroleum refining 75 percent of all non-wage payments are made in the form of pensions, insurance and payments for time not worked. These categories cover a shade more than 50 percent of the fringes paid by the chemical and allied industry.

In chemicals, social security payments and paid rest periods are very important. They constitute well over one third of the existing benefits; in petroleum refining these come to but one-seventh of the total.

The average employee in petroleum refining received \$975 in non-wage payments in 1951. Two hundred dollars behind—but in second place among manufacturing industries—come chemical employees with fringes valued at \$725. (In coal and steel, fringes per worker amount to less than \$600 per year.)

In the pulp and paper field, average annual benefits amount to \$535 in 1951. Social security payments, pensions and insurance, and payment for time not worked are all approximately equal and make up almost 90 percent of total fringe benefits.

Employees in the glass industry averaged \$477 in fringes in 1951. Pensions and insurance programs were the big items in the industry fringe pattern, amounting to well over 30 percent of total non-wage payments.

In the rubber and leather products field, annual average benefits per employee in 1951 amounted to \$512. By far the biggest part of this package—more than one-third of the total—is made up of payments for time not worked.

► **Size and Place**—It's impossible to spot any direct relation between the size of the firm and the amount of benefits.

In chemicals, plants employing from 2,500 to 4,999 people offered maximum fringes. Plants with less

than 500 employees ranked second. And in third place were chemical plants with more than 5,000 employees. There aren't many small petroleum refining plants, and maximum fringes were paid by plants over the 5,000 mark.

Pulp and paper plants using the services of between 1,000 to 2,499 employees paid the biggest fringes. In close succession came those employing fewer than 500, between 2,500 and 4,000, and more than 5,000.

In glass, maximum fringes are associated with plants employing more than 5,000. This is followed very closely by companies hiring fewer than 500 employees.

While the over-all picture revealed by the survey led to the conclusion that firms located in the West tended to lead those situated in the Northeast as far as the amount of benefits are concerned, this situation was reversed in the case of the chemical and process industries.

In every category within the chemical process field, plants located in the Northeast made maximum payments. And in the case of chemicals, the East North Central states trimmed the Western states by far in the amount of fringes.

► **The Trend**—Management officials, employees and economists have been high in their praise of the Chamber of Commerce contribution to business information. Spurred by the enthusiasm with which the original report was greeted, the chamber has consistently increased the size of the sample used in its survey.

There are 138 companies that have participated in the three surveys to date. By isolating the information provided by these firms it is possible to get an idea of how important fringes have become since the initial survey year of 1947. It is important to remember that, because of a difference in the size of the sample, averages of the figures provided by these 138 companies will differ from the 1951 averages discussed above.

In chemicals, the fringe payments as a percentage of payroll rose from 19.1 percent in 1947 to 20.9 percent in 1949—then to 22.1 percent in 1951.

In terms of annual benefits per employee the figure rose—during this same period—from \$541 to \$854.

## Fringe Benefits Comprise Many Items

	Total All Mfg.	Pulp, Paper, Lumber, Furniture	Chemicals & Allied Prods.	Petroleum Ref.	Rubber & Leather Prods.
Total fringe benefits as dollars per year per employee	599	535	725	975	512
1. Legally required payments (employer's share only)	137	144	133	121	114
a. Old age and survivors insurance	50	51	48	54	46
b. Unemployment compensation:					
(1) 0.3% tax to federal government	10	10	9	9	9
(2) State tax (net)	46	45	40	20	37
c. Workmen's compensation (including estimated cost for self-insured)	29	35	31	37	20
d. Railroad Retirement Tax, Railroad Unemployment Insurance, sickness benefits insurance, etc.	2	3	5	1	2
2. Pension and other agreed-upon payments (employer's share only)	146	124	184	412	93
a. Pension-plan premiums and pension payments not covered by insurance-type plan	88	65	115	351	34
b. Life insurance premiums, death benefits, sickness, accident and medical-care insurance premiums, hospitalization insurance, etc.	52	55	48	39	53
c. Separation or termination pay allowances	1	1	4	1	1
d. Discounts on goods and services purchased from company by employees	1	†	3	2	4
e. Miscellaneous payments (free meals, compensation payments in excess of legal requirements, payments to needy employees, tuition refunds, savings and stock purchases plans, etc.)	4	3	14	16	1
3. Paid rest periods, lunch periods, wash-up time, travel time, clothes-change time, get-ready time, etc.	74	67	110	21	82
4. Payments for time not worked	190	156	213	355	195
a. Paid vacations and bonuses in lieu of vacation	114	109	112	193	114
b. Payments for holidays not worked	64	47	75	82	79
c. Paid sick leave	8	2	21	71	1
d. Payments for State or National Guard duty, jury, witness and voting pay allowances, payments for time lost due to death in family or other personal reasons, etc.	44	†	5	9	1
5. Other items	52	42	85	46	23
a. Profit-sharing payments	25	24	24	54	1
b. Christmas or other special bonuses, service awards, suggestion awards, etc.	21	15	51	4	21
c. Special wage payments ordered by courts, payments to union stewards, etc.	6	3	10	8	6

† Less than 50c.

The advance in petroleum refining was even more spectacular. The figures for fringes as a percent of payroll were 18.7 percent, 20.4 percent and 25.9 percent. The dollar value of fringes rose from \$668 to \$833 and then to \$1,128.

In terms of all manufacturing, non-wage payments as a percentage of payroll climbed from 12.7 percent to 16.8 percent in 1951. Stated in terms of annual dollar benefits per employee, the rise was from \$375 to \$644.

Despite some exceptions there is a secondary trend evident behind the tendency for fringes to increase in importance. Industries that were in the vanguard with substantial non-wage payments in 1947 have increased these benefits through 1951. But their payments increased much less rapidly than those of companies which offered but modest benefits in 1947.

► **Economics of Fringes**—It is important not to over-interpret the statistics on fringe payments: They do not tell the whole story about the monetary rewards associated with different industries. In many cases both employer and employee prefer to have income entirely concentrated in the pay envelope.

In many cases, however, management and labor find undeniable attractions in agreeing to non-wage

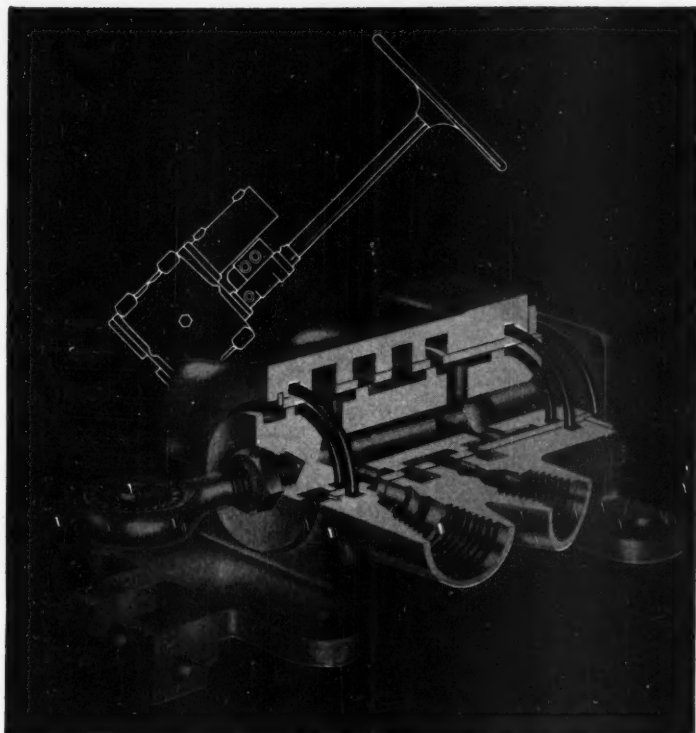
benefits. Employees find that fringes represent an improvement in their living standards that in many cases are not taxable.

And many times when it is clearly not in order to petition for a wage increase it is possible to seek fringe benefits via the social argument of improving working conditions and health standards. Finally, fringe payments do not generally come under wage control.

Chemical management officials often find that fringe payments are a very effective way of building good will among their employees. In addition, management often finds that they can provide their employees with certain benefits at a cost lower than would be required if the employees were to receive compensating pay increases.

Take free lunches, for example. Companies find real economy in mass buying and preparation of attractive lunches. The salary increase that would be required if each employee were to be given enough to pay for lunch would certainly be in excess of the cost of supplying the lunch.

Fringes are here to stay. Forward-looking chemical businessmen—and employees, too—will have to be thoroughly versed in the ins and outs of this expanding pattern of non-wage payments.



Cutaway view showing PARKER O-rings in control valve of Ross Hydropower Steering Gear.

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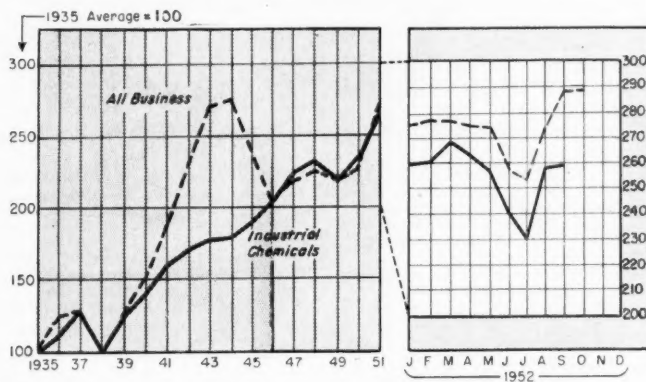
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# Process Industry Trends

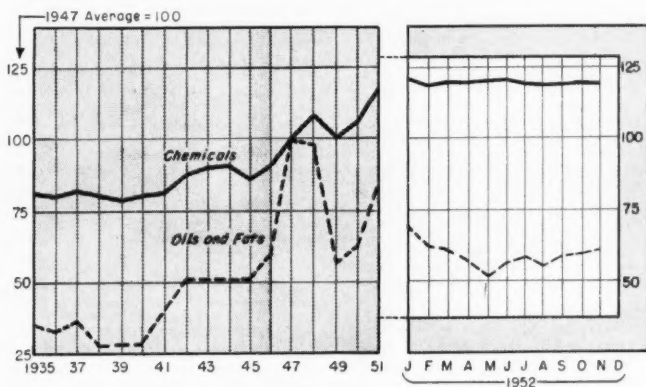
## CONSUMPTION



Industrial Chemicals Index

	Sept. (Est.)	Aug. (Prelim.)	July (Revised)
INDEX	259.00	258.19	230.12
Fertilizer .....		57.42	55.33
Pulp and paper .....	26.93	27.83	24.67
Petroleum refining .....	26.20	27.34	28.06
Iron and Steel .....	17.13	15.59	2.98
Rayon .....	30.56	30.50	28.20
Glass .....		23.37	22.84
Paint and varnish .....		27.01	27.00
Textiles .....		11.17	8.79
Coal products .....		11.20	3.53
Leather .....		3.82	3.58
Explosives .....		9.02	7.40
Rubber .....	6.12	5.37	5.16
Plastics .....		18.65	12.58

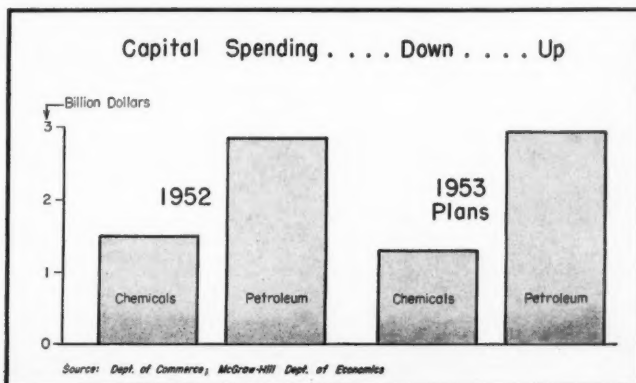
## PRICES



Chemical Engineering's Price Indexes

Chemicals	DOWN	-0.02%
Oils and Fats	UP	+2.0%
Chemicals	Oils & Fats	
As of November 1, 1952 .....	119.06	60.98
Last month .....	119.08	59.81
November, 1951 .....	119.92	74.24
November, 1950 .....	114.68	78.73

## HIGHLIGHT OF THE MONTH



### Next Year:

$$-13 + 5 = -1$$

Capital spending plans in the chemical industry indicate a drop of 13 percent for 1953. But this drop is from a peak of \$1.5 billion in 1952.

On the other hand, the petroleum industry plans to spend 5 percent more than it did in 1952.

The gain in capital investment in the petroleum industry offsets the loss in the chemical industry. Adding the capital spending figures together, the decline from 1952 to 1953 is only 1 percent.



# New Construction

## Proposed Work

Ariz., Florence—West Coast Pipe Line Co., L. Glasco, Pres., M & W Tower Bldg., Dallas, Tex., plans to construct a refinery here. Ebasco Services, 2 Rector St., New York, N. Y., Cons. Engrs. Estimated cost \$3,000,000

N. M., Farmington—El Paso Natural Gas Co., El Paso, Tex., plans to construct additional gasoline absorption plant facilities, additional dehydration facilities and two compressor units. Estimated cost \$7,000,000, \$4,500,000 and \$1,300,000 respectively.

N. C., Kings Mountain—Foote Mineral Co., Kings Mountain, plans to construct an addition to its plant. Estimated cost \$200,000

O., Cleveland—Industrial Rayon Corp., Union Commerce Bldg., plans to construct 1 story, 156x165 ft. factory for manufacturing cord for tires. Osborn Engineering Co., 7016 Euclid Ave., Archt. and Engr. Estimated cost \$500,000

Okla., Sapulpa—Liberty Glass Co. c/o Geo. F. Collins, Jr., Sapulpa, plans to enlarge its glass plant. Estimated cost \$500,000

Pa., Marcus Hook—Sun Oil Co., 1608 Walnut St., Philadelphia, plans to construct a research building. P. B. Barton, Ch. Engr. for Company. Estimated cost \$300,000

## Contracts Awarded

Ala., Tallapoosa—B. F. Goodrich Co., Main St., Akron, O., has awarded the contract for a plant addition to Brice Building Co., P. O. Box 1028, Birmingham. Estimated cost \$90,000

Calif., Richmond—Standard Oil Co., 225 Bush St., San Francisco, has awarded the contract for a synthetic phenol plant to Stone & Webster, Russ Bldg., San Francisco. Estimated cost \$4,000,000

Calif., Tracy—American Reinforced Paper Co. of Attleboro c/o W. A. Corlett, Archt., 347 Clay St., San Francisco, has awarded the contract for a paper plant to B & R. Construction Co., 110 Market St., San Francisco. Estimated cost \$527,000

Calif., Ventura—Shell Chemical Corp., Box 1451, has awarded the contract for an ammonia processing plant to M. W. Kellogg Co., Box 48. Estimated cost \$220,000

Calif., Wilmington—Shell Oil Co., 1008 West 6th St., Los Angeles, has awarded the contract for a crude oil refinery to Bechtel Co., 3780 Wilshire Blvd., Los Angeles. Estimated cost \$400,000

Ga., Atlanta—Precision Paint Co., 500 Stewart Ave., S. W., has awarded the contract for a manufacturing plant to McDonough Construction Co. of Georgia, 7 Baltimore Pl., N. W. Estimated cost \$350,000

Ill., Skokie—George D. Searle & Co., Searle Pkway, has awarded the contract for a research building at its pharmaceutical plant to George A. Fuller Co., 111 West Washington St., Chicago. Estimated cost \$1,300,000

	Current Projects		Cumulative 1952	
	Proposed Work	Contracts	Proposed Work	Contracts
New England.....			\$7,600,000	\$5,379,000
Middle Atlantic.....			44,100,000	57,398,000
South.....	\$500,000	\$28,190,000	380,565,000	283,651,000
Middle West.....	500,000	3,600,000	64,450,000	147,810,000
West of Mississippi.....	13,300,000	71,063,000	617,283,000	547,040,000
Far West.....	3,000,000	5,147,000	131,915,000	48,935,000
Canada.....		301,000	162,835,000	48,689,000
Total.....	\$17,300,000	\$106,301,000	\$1,408,726,000	\$1,108,402,000

Ill., West Chicago—Lindsay Light & Chemical Co., West Chicago, has awarded the contract for expanding its chemical and rare earths plant to Thomas R. Shaver, 53 West Jackson, Chicago. Estimated cost \$1,800,000

Ind., Gary—Vulcan Detinning Co., Seward, N. J., has awarded the contract for a detinning plant here to The Austin Co., 520 North Dearborn St., Chicago, Ill. Estimated cost \$500,000

La., Logansport—Southern Natural Gas Co., Watts Bldg., Birmingham, Ala., has awarded the contract for a gas compressor station to Ford, Bacon & Davis, Inc., 39 Bway., New York, N. Y. Estimated cost \$1,250,000

Miss., Columbus—Oldbury Electro-Chemical Co., Buffalo Ave. and 50th St., Niagara Falls, N. Y., has awarded the contract for a chemical plant to D. S. McClanahan & Sons, Columbus. Estimated cost \$3,500,000

Miss., Pascagoula—Gulf Improvement Co. c/o M. T. Reed Construction Co., 162 Millsaps Ave., Jackson, Miss., contractor, will construct a nitro-phosphate fertilizer plant here. Estimated cost \$200,000

Mo., St. Louis—Papin Investment Co., 2701 Papin St., has awarded the contract for a 1 story, 75x123 ft. warehouse addition to be leased to Dennis Chemical Co., to Murch-Jarvis Co., 718 Locust St., St. Louis.

Mont., Billings—Carter Oil Co., Arts Bldg., has awarded the contract for a warehouse to Wells Bros. Construction Co., Billings. Estimated cost \$108,115.

Mont., Kalispell—Anaconda Copper Mining Co., 25 Bway., New York, N. Y., has awarded the contract for an aluminum plant to Wixson & Crowe, Inc., Redding, Calif. Estimated cost \$45,000,000

Okla., Pauls Valley—Lone Star Gas Co., 1915 Wood St., Dallas, Tex., will construct a dehydration plant unit with own forces. Estimated cost \$370,000

Okla., Pryor—Deere & Co., Pryor, and 1325 Third Ave., Moline, Ill., has awarded the general contract for a chemical plant to have a daily capacity of 180 tons of ammonia and 275 tons of urea, including gate and change houses, maintenance building and warehouse, to W. R. Holoway & Assoc., 302 East 18th St., Tulsa; process facilities to Foster-Wheeler Corp., 165 Bway., New York, N. Y. Estimated cost between \$17,000,000 and \$20,000,000

Tex., Corpus Christi—Pontiac Refining Corp., 3400 Lawrence Dr., has awarded the contract for improving and enlarging its refinery to C. Thaxton & Sons, Gregory, at \$266,815

Tex., Dallas—Pollock Paper Co., 2236 South Lamar St., has awarded the contract for a factory to O'Rourke Construction Co., Box 5384, at \$304,000

Tex., Hawkins—Natural Gasoline Co., Hawkins, has awarded the contract for a plant addition to Gasoline Plant Construction Co., N. Esperson Bldg., Houston. Estimated cost \$475,000

Tex., Houston—Eastern States Petroleum Co., Ship Channel, will reconstruct the cracking tower at Plant No. 1. Work will be done by owners. Estimated cost \$100,000

Tex., Houston—Humble Oil & Refining Co., Midland, has awarded the contract for a warehouse to Telephon Construction Co., 1710 Telephone Rd., at \$93,160

Tex., Houston—Phillips Chemical Co., Commerce Bldg., has awarded the contract for a superphosphate plant to Rust Engineering Co., 575 6th Ave., Pittsburgh, Pa. Estimated cost \$3,000,000

Tex., LaPorte—E. I. du pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., has awarded the contract for a warehouse to J. Emil Anderson & Sons Co., 1809 Baltimore Ave., Chicago, Ill. Estimated cost \$900,000

Tex., Phillips—Phillips Petroleum Co., Phillips, will improve its aviation alkylate plant unit. Work will be done by day labor and subcontracts. Estimated cost \$453,860

Tex., Ropesville—Honolulu Oil Corp. and Signal Oil & Gas Co., Ropesville, has awarded the contract for a gasoline plant to Hudson Engineering Corp., 2711 Danville St., Houston. Estimated cost \$1,225,000

Tex., Sweeney—Phillips Petroleum Co., Bartlesville, Okla., will improve a portion of its refinery unit. Work will be done by purchase and hire. Estimated cost \$185,000

Va., Hopewell—Allied Chemical & Dye Corp., Nitrogen Div., 61 Bway., New York, N. Y., has awarded the contract for a new plant for developing activities of organic department to Wigton-Abbott Corp., 1225 South St., Plainfield, N. J. Estimated cost \$1,000,000

Ont., Niagara Falls—North American Cyanamid, Ltd., 1 Fourth Ave., has awarded the contract for a 2 story addition to its plant to Smith Bros. Construction Co., Ltd., 1740 Ellen St. Estimated cost \$100,000

Ont., Sarnia—Imperial Oil, Ltd., 30 Church St., Toronto, has awarded the contract for a laboratory addition to Curran-Hervidge Construction, Ltd., 283 Confederation, at \$201,480

**BACK IN THE 1880's**

**WHEN WORLD ASTRONOMERS FIRST PHOTOGRAPHED THE HEAVENS**

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22' dia. x 20' long horizontal tank

20,000 gal. stainless steel jacketed kettle

Plant

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154 Ogden Ave., Jersey City 7, N.J.

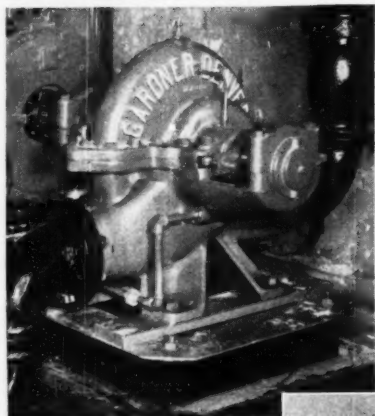
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There's a pumping expert near your plant who will gladly give you sound advice on any pumping problem. He's your Gardner-Denver field engineer—a man trained to help you plan good pumping installations—a man experienced in achieving dependable pumping that's easy on the power budget.

Write today for the name and address of the Gardner-Denver pumping expert nearest you.

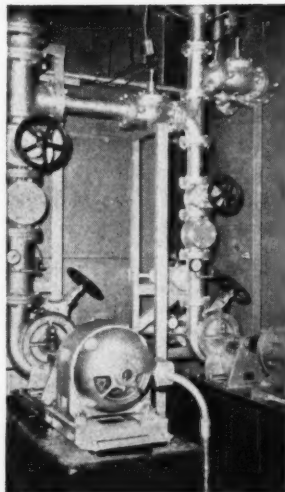
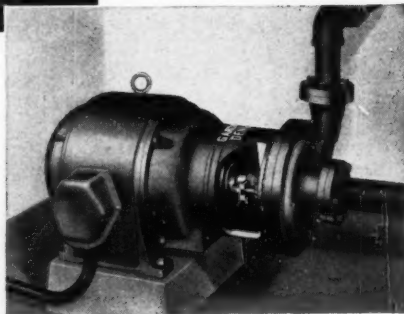


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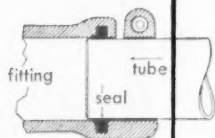
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 for joining pipe or tube  
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Designed to reduce assembly costs and to permit the use of less expensive lighter wall tubing. **Quikupl** stainless steel elbows, tees, couplings, reducers and adapters save you time, labor, materials and money.

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LEADING PRODUCER OF STAINLESS STEEL VALVES, FITTINGS & CASTINGS

*Four years maintenance-free service on Propane at 300 pounds pressure—temperatures from 60° F. above to 40° F. below zero . . .*

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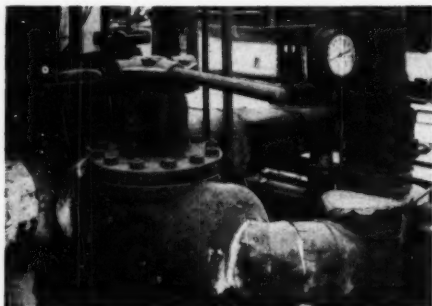
A prominent Mid-Western Oil Refiner\* installed a 3", flanged, cast-steel, straightway HOMESTEAD Lever-Seald VALVE on Propane service at 300 lbs. working pressure with a temperature range from 60° F. above to 40° F. below zero. After four years service, with no maintenance except repacking, the valve still held tight.

That sold him—proved to him that HOMESTEAD Lever-Seald VALVES are his "best buy!" Today he is using Lever-Sealds on Propane and on drag lines from stills, another difficult service.

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*Drag line from still handling oil and tar at 800° F., 100 lbs. pressure.*



*Propane at 300 lbs. pressure, minus 40° F.*



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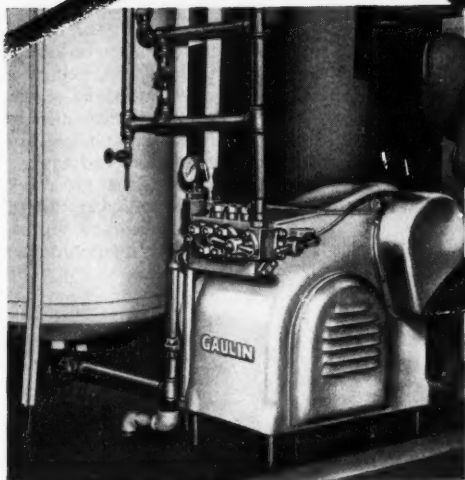
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It's Uniformly  
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BRISTOL MEYERS installation at Hillside, N. J. showing 500 GPH Gaulin Homogenizer used in processing Vitalis Hair Cream.



because it's  
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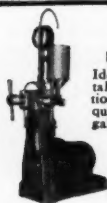
## ...with a Gaulin Homogenizer

Cream oils look less greasy, feel less greasy... spread quicker, hold better when they're made with a Gaulin Homogenizer.

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Stator is jacketed for cooling or heating. Gap setting adjustable for .001" to .045". Only 45 seconds clean-up required in changing colors. 12" head room. 12" x 17" floor area.



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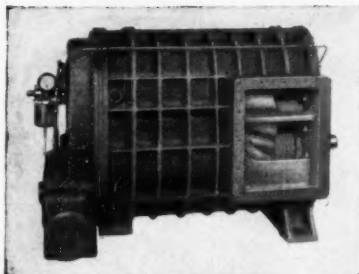
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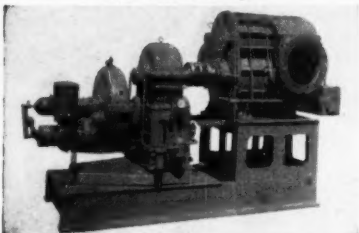
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# STANDARD AIRE BLOWERS *for easy* ADAPTABILITY



Standardaire Blower with side intake and discharge.



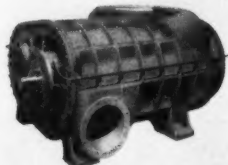
Standardaire Blower with turbine and gear drive unit.



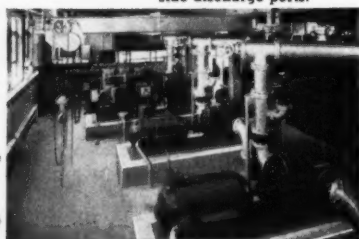
Standardaire Blower with side intake and end discharge.

Installation showing three Standardaire Blowers.

**T**o meet the specific needs for industry, Standardaire's unique design provides for maximum flexibility in meeting unusual requirements for intake and discharge connections. For example, the blower intake or discharge ports can be located on the end, top, bottom or sides—two intake or discharge ports may also be provided when necessary. These exclusive features, plus provisions for direct drive by a power unit of your choice, are typical examples of Standardaire's adaptability.



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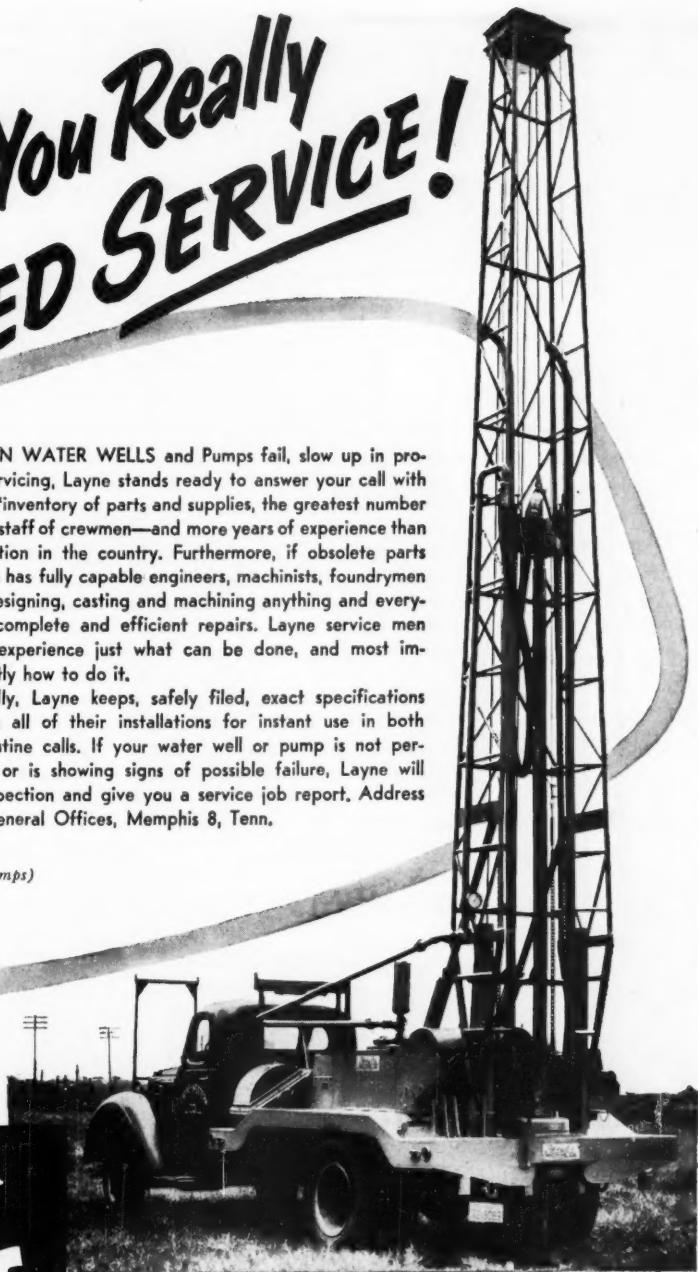


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**EXTRA THICKNESS\*** in critical areas...  
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MEDIATE ALLOYS  
AND VARIOUS  
STAINLESS STEELS.



*Check* ✓

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of **KEY-KAST** welding fittings against  
your alloy fitting needs!

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- ✓ Lower unit cost.
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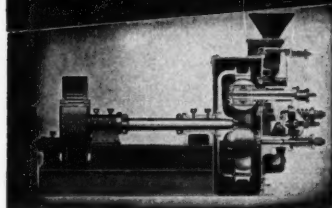
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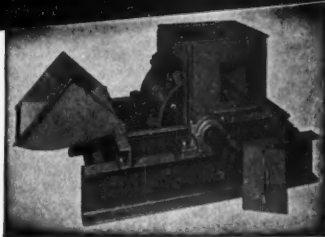
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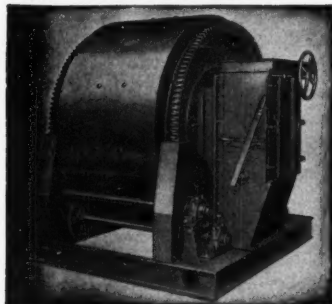
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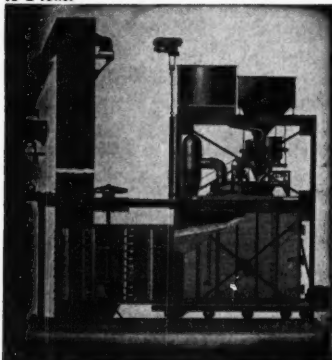
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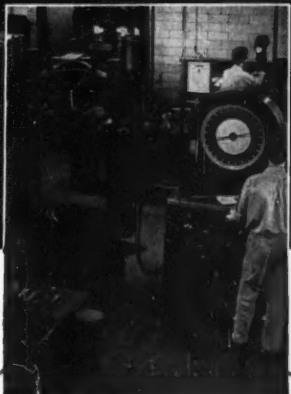
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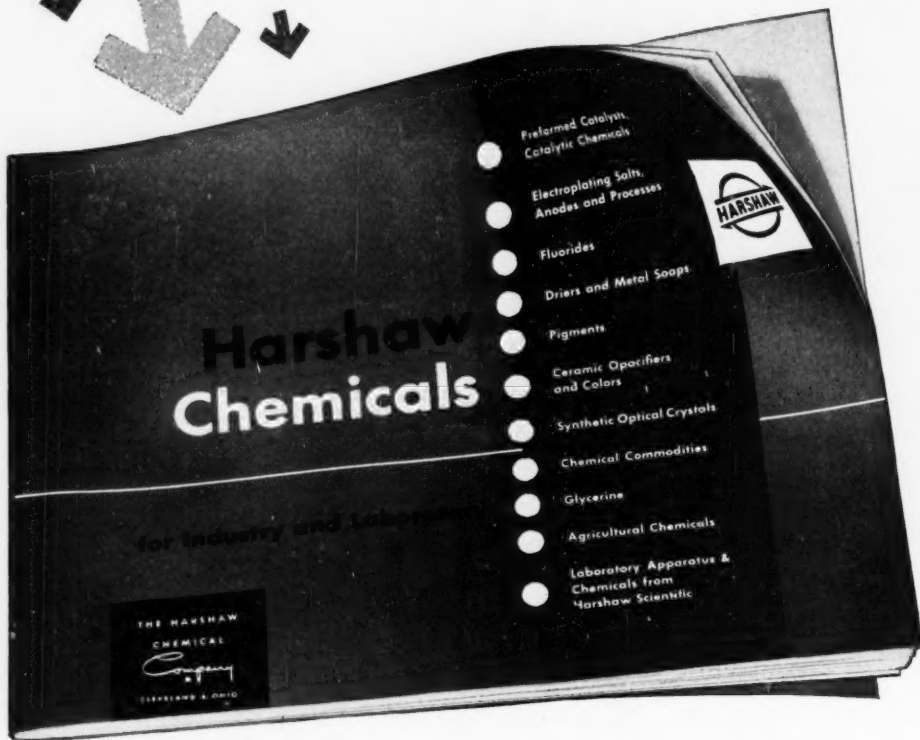
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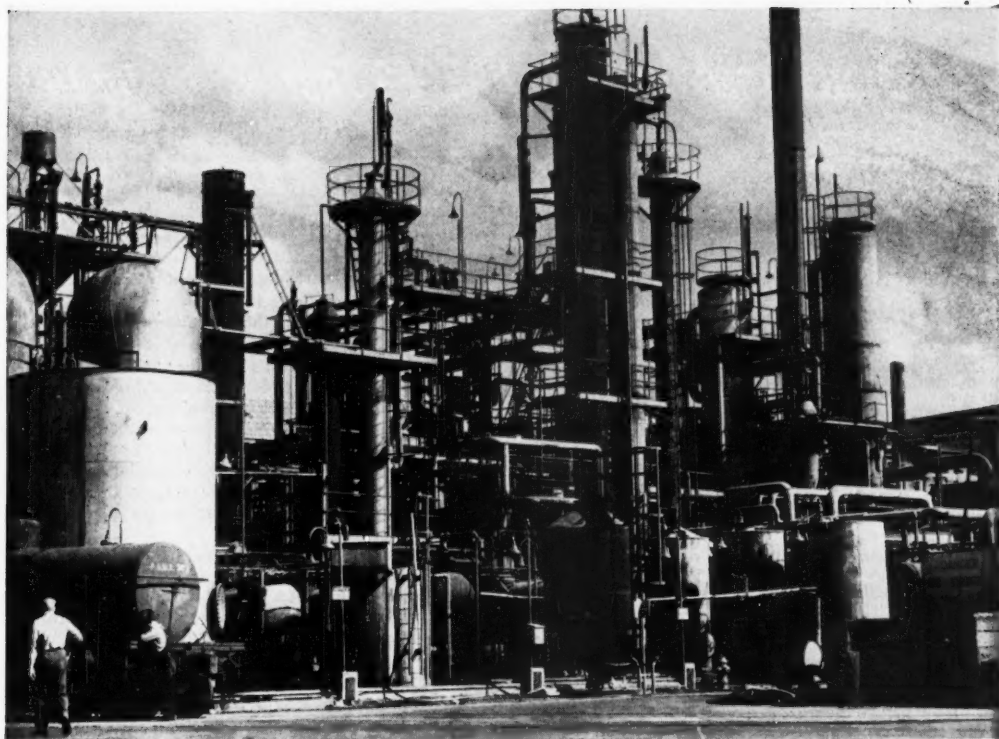
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Howell Motors are used throughout the chemical industry, because in the Howell line there is a motor to fit the requirements of every job. And Howell's careful attention to the details of design and manufacture assure uninterrupted production with minimum maintenance.

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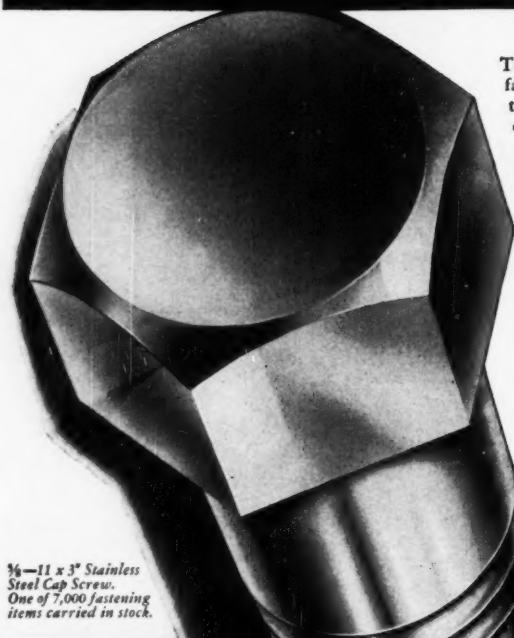
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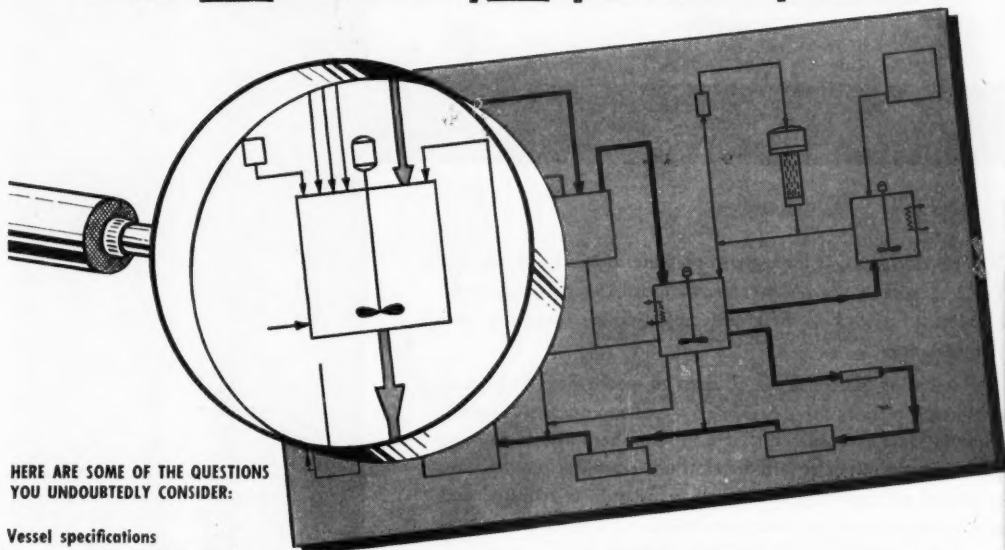
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## = the best unit for your particular process?



HERE ARE SOME OF THE QUESTIONS  
YOU UNDOUBTEDLY CONSIDER:

### Vessel specifications

*Vertical or horizontal?  
Optimum length-to-diameter  
ratio?  
Materials of construction?  
Top: flat or dished, welded or  
bolted?  
Bottom: dished, flat, pitched  
or conical?  
Jacket or internal coils?  
Baffle type and arrangement?*

### Agitator specifications

*Type of impeller: turbine,  
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what? Size? Speed of rota-  
tion? Location? Type of  
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you whatever help you need.** Whether your problem in-  
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I\*P\*E can give you the best and most economical unit for your  
particular needs. Talk it over with an I\*P\*E engineer today!

**If you do turn out the complete engineering and  
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ENGINEERS, DESIGNERS AND MANUFACTURERS OF PROCESS PLANTS AND EQUIPMENT

for low-cost suction pressures

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## I-R STEAM JET EJECTORS

Where processes call for vacuum pressures down to 50 microns (.002" Hg abs), the I-R Steam Jet Ejector can generally make important savings in first cost, installation, operation and maintenance.

The steam jet ejector is the ultimate in mechanical simplicity, consisting of only three basic parts—a steam nozzle, a suction chamber and a venturi-shaped diffuser. There are no moving parts to wear out or require lubrication—no vibration—nothing to adjust or replace. Little or no foundation is required and space requirements are very moderate.

Ingersoll-Rand can supply Steam Jet Ejectors, designed for any capacity requirements within their vacuum pressure range. They will handle wet or dry mixtures of air, gases and vapors, and accidental entrainment of liquid will do no damage. I-R Ejectors are available in single-stage, two-stage, and multiple-stage designs—with pre-coolers, intercondensers and after condensers as required for any specific application.

Remember, I-R engineers are specialists in vacuum-producing equipment—including both steam-jet ejectors and reciprocating vacuum pumps. Their recommendations for *your* vacuum equipment are therefore based solely on your own best interests. For further information, consult your nearest I-R representative. Or write for a free copy of Bulletin 9013A.

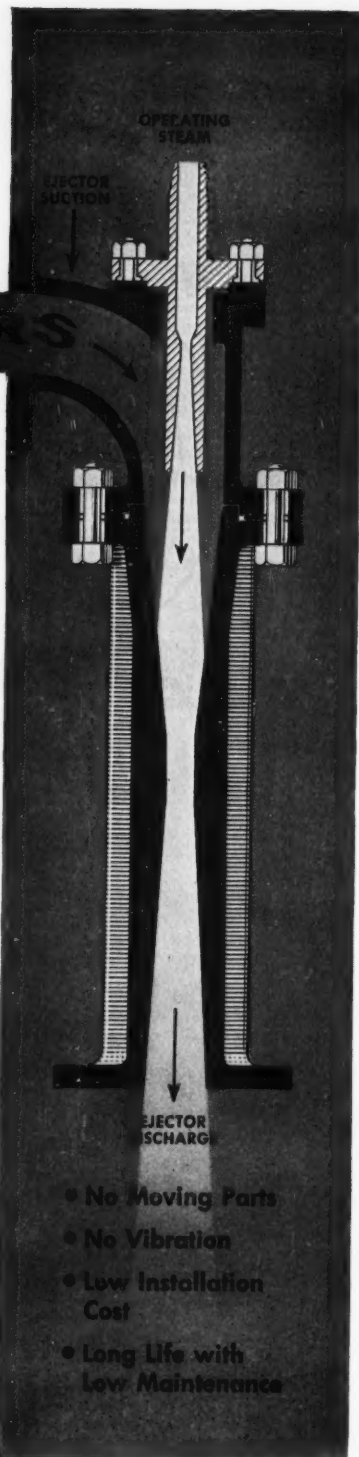


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COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS  
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- Long Life with Low Maintenance

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# FACTS

**It's a FACT ...**



... Kinney originated the rotating plunger vacuum pump ... universally acclaimed for fast pump down and quick recovery.

**It's a FACT ...**



... Kinney pioneered the oil-sealed pumping system.

**It's a FACT ...**



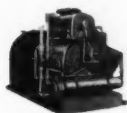
... Kinney is the **BIG LINE** of mechanical vacuum pumps ... more models, more sizes, more capacities to choose from.

**It's a FACT ...**



... Only Kinney offers in such a wide range both single stage and compound vacuum pumps — for creating and maintaining low absolute pressures alone or with diffusion pumps.

**It's a FACT ...**



... More vacuum processes depend on Kinney Vacuum Pumps than on any other make or type of pump.

Find out for yourself how Kinney Vacuum Pumps can help in your low pressure processes — in laboratory, pilot plant, or production.

Send coupon or write for details.



Kinney Manufacturing Co., Boston 30, Mass. Representatives in New York, Chicago, Detroit, Cleveland, Atlanta, Philadelphia, Pittsburgh, Johnstown (Pa.), Los Angeles, Charleston (W. Va.), Houston, New Orleans, San Francisco, Seattle and foreign countries.

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| <input type="checkbox"/> Vacuum drying       | <input type="checkbox"/> Vacuum coating      | <input type="checkbox"/> Vacuum metallurgy |
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SUBSIDIARY OF THE NEW YORK AIR BRAKE CO.

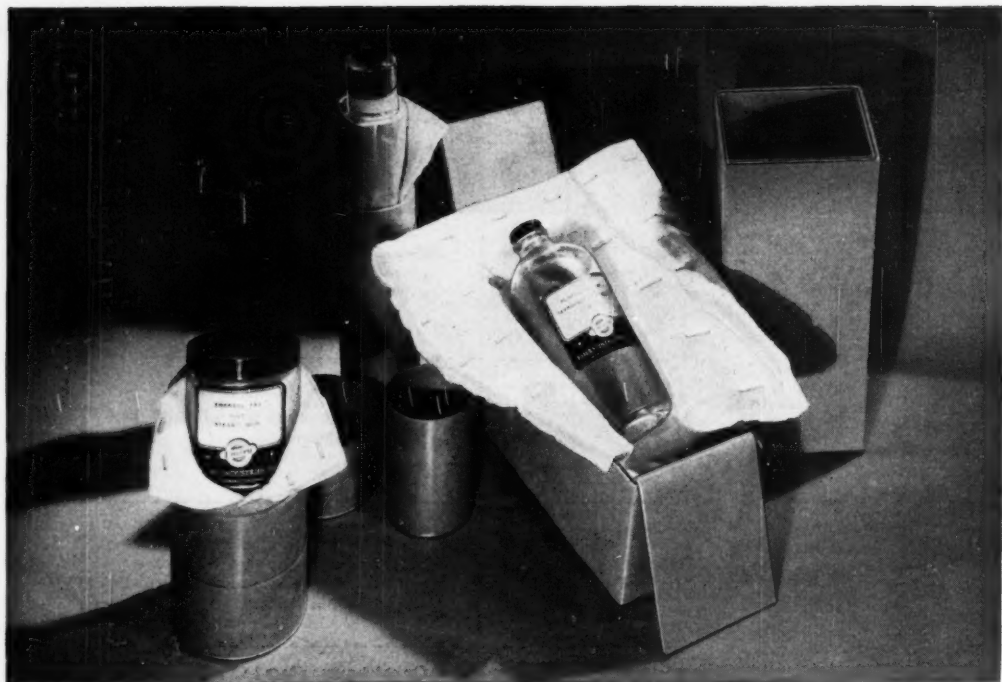


Photo courtesy of Emery Industries, Inc., showing their standard method of mailing chemical samples.

## Are your chemical products packaged as efficiently as these?

Whenever your product arrives at its destination damaged in any way, you suffer a loss not only of money, but of time and good will, too. Yet it's easy to prevent damage in transit and speed up packaging operations through the use of up-to-date packaging materials. Many chemical companies have discovered this about Kimberly-Clark Interior Packaging—KIMPAK®—a modern packaging material of unlimited versatility that provides *custom protection* for every type of chemical product.

KIMPAK is soft and clean, conformable—easy to apply as wrapping paper. It protects the most delicate products against shock, vibration, and rough handling in transit. Light in weight,

KIMPAK gives more protection than most materials of far greater weight and density. And KIMPAK absorbs up to 16 times its own weight in moisture within 30 seconds to comply with Parcel Post regulations.

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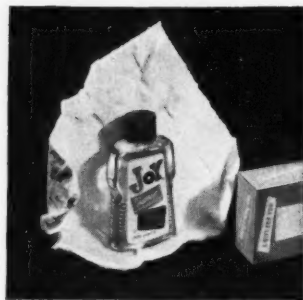


Photo courtesy of Procter & Gamble — Joy, a dishwashing detergent.

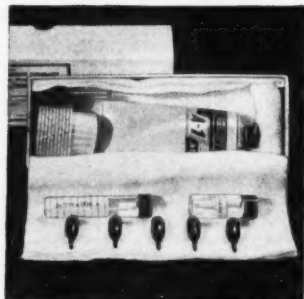


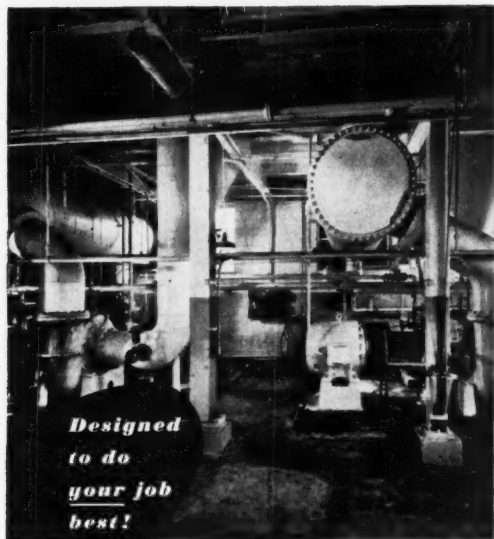
Photo courtesy of Armstrong Products Co. — Adhesives.

\* U. S. REG. U. S. & FOREIGN COUNTRIES

See  
General American for

**CREATIVE  
EVAPORATOR  
ENGINEERING**

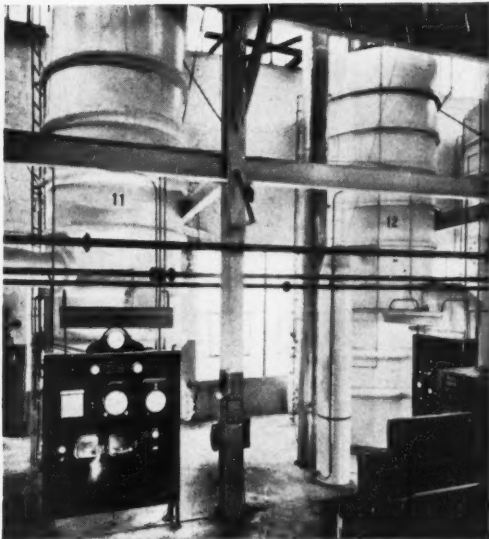
## Reduce scale deposits . . . Boost production with Conkey forced circulation horizontal tube evaporators



***Designed  
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best!***

Liquids that tend to "scale up" need not push down your production. The Conkey forced circulation horizontal tube evaporator circulates large volumes of liquid at high velocities—through submerged and flooded tubes. In many cases, this scrubbing action is sufficient to greatly retard coating of tubes, even eliminating the scaling problem entirely.

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of the high heat transfer coefficients obtained by forced circulation.

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# What do you do when you don't have the right size v-belt in stock?

1

Contact your supplier for a replacement

...and wait for delivery  
...wait—and watch production stay at zero



3

Stock **VEELOS**...

2



Send someone to get the required belt

...and pay your employee while he goes for the belt  
...pay through loss of production



## GET ALL THE FACTS



This Veeelos Data Book gives complete details about construction, installation and uses. Write for free copy of this money-saving book today.

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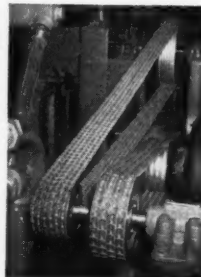
- ...and always have the right size belt when you need it
- ...any length can be made up from a 100-foot reel
- ...inventory is automatically maintained
- ...available from 350 distributors

## VEELOS in stock is Production Insurance

Belts for replacement always on hand—just 4 reels of Veeelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts.

Link construction permits quick installation—without removing outboard bearings.

Adjustability provides controlled tension on each belt—vibrationless, full power delivery is assured.



## ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEEELINK outside the United States.



## WELDING PIPE FITTINGS OF STAINLESS STEEL... *in regular and special analyses*

**H**ERE are precision made fittings that give you stronger, lighter joints, accurately aligned, easily installed, and free from costly maintenance. They are made in both butt weld and socket weld types, in 90° and 45° elbows, 180° returns, tees, caps, reducers, laterals, crosses, and lap joint stub ends.

Sizes range from 1" to 14". Larger sizes are made to special order, and special shapes and types are made to engineering specifications.

To combat corrosive agents of various kinds, a selection of both standard and special analyses is available. One of these in all probability will fit the special need in your plant. Inquiries involving any corrosive problem are welcome. See your nearest ESCO representative or write us directly, giving details of corrosive agents used, their concentrations, temperatures and pressures. For dimensional data on ESCO Welding pipe fittings fill in and mail the coupon.

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STAINLESS AND HIGH ALLOY STEELS

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Please send dimensional data on ESCO welding pipe fittings.

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## **This is Why the Nash is the Most Simple Compressor**



## *It's the Nash!*

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

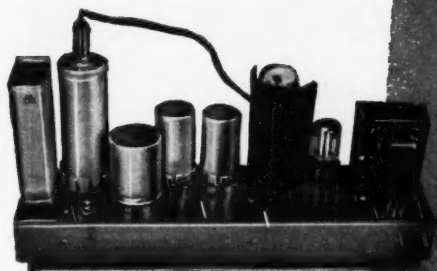
Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

**NASH ENGINEERING COMPANY**  
313 WILSON, SO. NORWALK, CONN.



Good engineering shows in this Amplifier's wide range of sensitivities, and of impedances, thorough filtering and plug-in connection to the rest of the Speedomax instrument.



Good engineering shows in this Converter's phenomenally low noise level and in its long-lived performance.

Good engineering shows in this Slide-wire's non-inductive winding and in absence of any flexible leads which might form inductive loops.



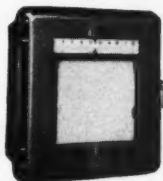
Good engineering shows in this balancing motor's small size, and in its torque ample to operate accessory control and signaling fittings.

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Expansion program of this long-established firm has many features to attract outstanding recent graduates in engineering and science. Opportunities are in sales field engineering, product and application engineering, research, advertising, market development. Widely-respected policies assure recognition of progress and achievement. Address Personnel Manager for preliminary interview at nearest of 17 L&N offices.

## A lot of Engineering for an Amplifier, but...

it helps Speedomax to fit your ideas!



• Your needs and ideas put this electronic "tool" to work on an amazing variety of jobs. Controlling furnaces and peering into atoms; counting bottles and spying on the weather; taking the "shine" out of rayon or putting it on hardware, to name six out of thousands of uses. For, in general, if you can feed Speedomax a tiny electrical signal, representing the condition you wish to measure, the instrument will not only put "calipers" on it, but will amplify it enormously to direct anything that can be directed through electrical or pneumatic means.

The Speedomax way of handling this job provides particularly accurate results and an especially good fit in meeting your individual ideas. For instance, there's the matter of receiving the signal in a way suited to its size—or, more usually, to its smallness.

We have no less than twenty-three carefully-engineered Speedomax Amplifiers covering a wide range of sensitivity and impedance levels. One Amplifier in the series enables the Speedomax to respond to a signal of only 10-16 watt—one ten-billionth of a microwatt. No other recorder amplifier comes within 3 magnitudes of this figure. Such sensitivity means corresponding accuracy in detecting the tiny unbalance—called "error" by circuit engineers—which actuates the rebalance system.

In terms of power, all 23 Amplifiers deliver the same—5 or 6 watts. This is from 2 to 4 times the output of other recorder amplifiers; permits a more powerful balancing motor. And the Amplifier-Motor team provides an especially high torque gradient just where it's needed—centering around the balance point—for prompt, positive balancing and easy, effortless operation of a "heavy" load of control or signal devices in the motor shaft.

The Speedomax story for industry is told in Catalog ND46(1); for Research, in Tech. Pub. ND46(1). We will send either on request; address our nearest office or 4916 Stenton Ave., Phila. 44, Pa.

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Instruments



**NORTHROP**

automatic controls • furnaces

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# Every User of Heat Insulation Can Profit From This New Book



## WRITE FOR YOUR COPY

This useful book, replete with pictures, graphs and charts, contains specific information on Kaylo Heat Insulation, including characteristics . . . efficiencies . . . recommended thicknesses . . . and application data for pipes, vessels and flat surfaces. For your free copy of this book, write: Dept. N-265, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

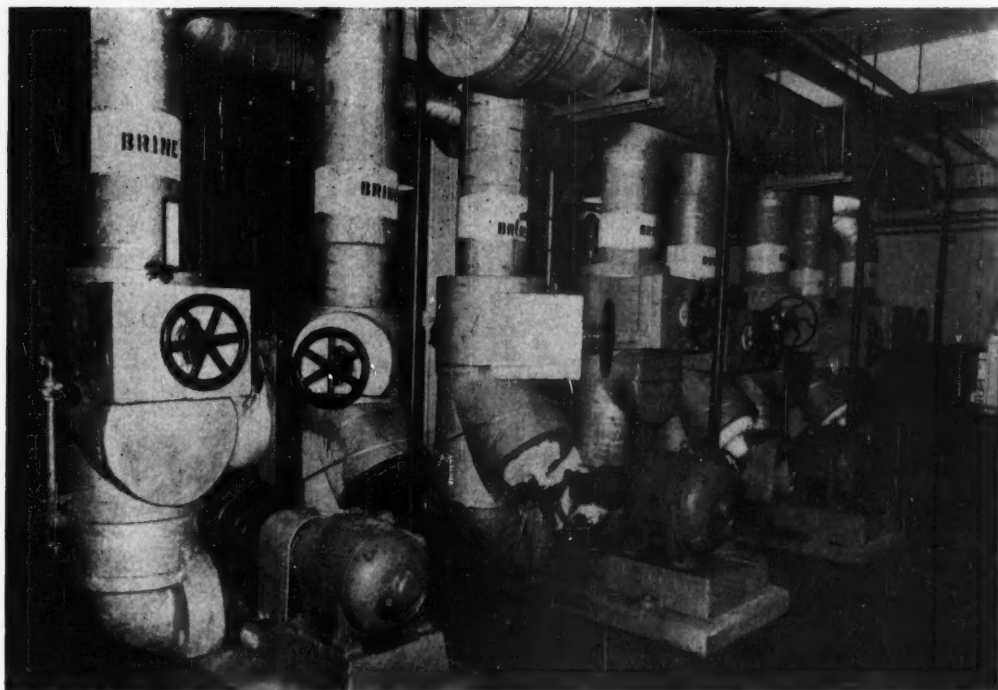
Kaylo Heat Insulation is a hydrous calcium silicate—the heat-saving material that is revolutionizing insulation practice with its outstanding combination of advantages.

# KAYLO® . . . first in calcium silicate

...pioneered by OWENS-ILLINOIS Glass Company

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## They couldn't take a chance with these brine lines— ... so they insulated with FOAMGLAS!

● Condensation could make short work of ordinary insulation on these 0°F. brine lines. So, to eliminate the fuss and *high cost* of replacing ruined insulation, American Cyanamid Company chose FOAMGLAS for the indoor brine lines and coolers shown here.

Even without a protective coating of any kind, FOAMGLAS resists water and will not transmit vapor under these service conditions. And, since it is a 100% glass product—no organic binders or fillers—FOAMGLAS is unaffected by all ordinary chemicals, it furnishes no food for vermin, and it

will not burn.

The high insulating efficiency of FOAMGLAS is caused by unique cellular construction. Every rigid block of FOAMGLAS contains millions of tiny, isolated air cells; each air cell completely surrounded by glass.

In other words, with FOAMGLAS, you have a *material* that is inert—glass, combined with cellular construction—the most efficient *form* of insulation.

It's an unbeatable combination of properties if you want an insulation that you can install and *forget*.

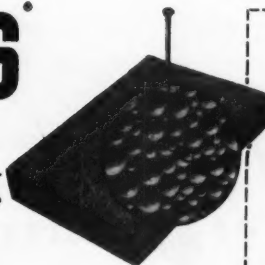
PITTSBURGH CORNING CORPORATION • PITTSBURGH 22, PA.



# FOAMGLAS®

*the cellular glass insulation*

The best glass insulation is cellular glass. The only cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verminproof. It has unusually high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.



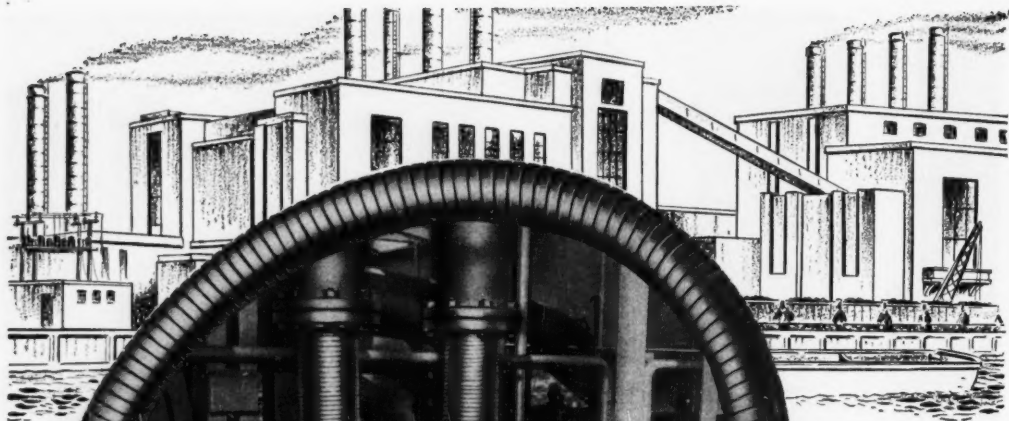
Pittsburgh Corning Corporation  
Dept. CC-112, 307 Fourth Avenue  
Pittsburgh 22, Pa.

Please send me, without obligation, a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

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Penflex flexible expansion joints installed on safety blow-off valves above superheaters in big West Coast power plant.

## FLEXIBLE PENFLEX STANDS STEAM SHOCK

### PENFLEX TUBING ABSORBS THERMAL EXPANSION . . . PREVENTS BLOW-OUT

Without warning, the safety valves atop these big superheaters suddenly pop. A mighty surge of 900 F. eight-hundred-and-fifty-pound steam blasts through the pipes to exhaust to atmosphere. These pipes have to know how to take it!

Ordinary rigid pipe would blow apart under the terrific thermal expansion. But Penflex flexible metal tubing has enough "give" to take the shock. Six lengths of 8" Penflex interlocked tubing in-

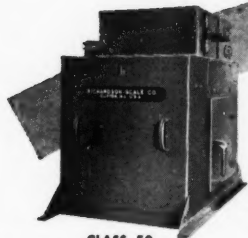
stalled as expansion joints on the boiler blow-off line cushion the sudden impact . . . take up any pipe movement due to extreme temperature and pressure changes.

Penflex engineers can help you solve your tough tubing problems. Penflex makes a complete line of 4-wall interlocked and seamless welded corrugated tubing . . . metallic hose, tubing and couplings from  $\frac{1}{8}$ " I.D. up . . . automatic barrel fillers, pneumatic rivet passers, accessories and fittings. Write for illustrated folder "Flexineering." It's a valuable production aid.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7234 Powers Lane, Phila. 42, Pa.  
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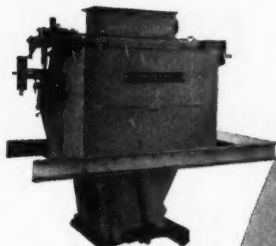
**penflex**  
HEART OF INDUSTRY'S LIFE LINES





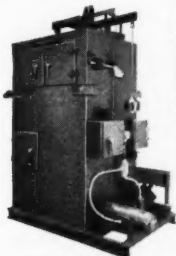
**CLASS 50**

Dust-tight, all-electric, high-speed, accuracy-indicating scale for weighing dry, ground, granular, dusty, non-free-flowing and some small lumpy materials. Bulletin 3649.



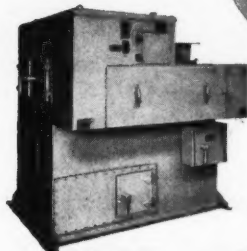
**CLASS 38**

Dust-tight, heavy-duty scale for dry, ground, dusty, non-free-flowing materials. Bulletin 8946.



**CLASS 40**

Accommodates screw, belt, or vibrating feeder for handling wide range of materials. Dust-tight, solenoid- or motor-operated discharge, accuracy-indicating. Bulletin 1449.



**CLASS 39**

Self-contained, dust-tight, belt-feeding and weighing unit. Accuracy-indicating for process or intermittent batch weighing of lumpy, crushed, sluggish materials. Bulletin 1549.

what can WE  
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Mr. Processor?

Frankly, that's the reason we're running this ad—not to tell you about our products, but to ask you about your plant problems. Because if your business involves the handling of any materials or liquids by weight, we think you probably have an operation or two which just doesn't measure up in efficiency, economy, or speed. We'd like to know about it, because we think we can help.

You can call it pride, or conceit, or self-satisfaction, or self-confidence, but our engineers have never been stumped for long by a problem in materials-handling by weight—and in fifty years of working with the biggest names in American industry we've seen a lot of them! From aluminum sulphate, to zinc oxide, and back to almonds we've successfully installed Richardson units or systems to handle just about everything in the book, and built a lot of goodwill and a fair-size company in the process.

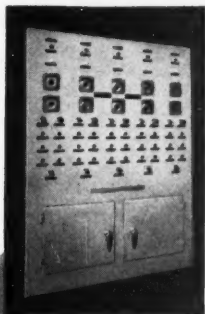
Naturally, if a Richardson Scale can contribute to the smoother, faster, or more profitable operation of your plant, we'd like to sell you one. We think that our products and experience can help in solving your problem in processing, and if you'll outline it, we'll be glad to have one of our field engineers arrange to go over it with you.

Or, if you'd just like to know more about Richardson Scales for possible future reference, simply clip this ad to your signed letterhead and mail. Bulletins 0450, 0550, and 0351 will be sent you by return mail—no obligation.

The Richardson Scale Company, Clifton, N. J., will be glad to supply information on:

Feeder-Weigher Systems • Automatic Bulk Weighing Hopper Scales • Automatic Bagging Scales • Bag Sewing Conveyors Packers • Process Control Panels and Select-O-Weigh

Please write direct to our Clifton office, or to the nearest of our branch offices located in Atlanta, Boston, Detroit, Minneapolis, Cincinnati, Wichita, Montreal, Omaha, New York, Pittsburgh, San Francisco, Toronto, Buffalo, Chicago, Philadelphia, Houston, St. Louis.



**CONTROL PANEL**

Richardson-designed panels such as this control whole automatic weighing systems composed of scales like those at the left.

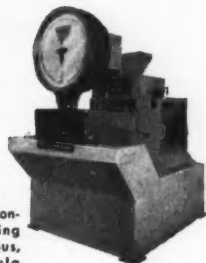
**Richardson**

MATERIALS HANDLING BY WEIGHT SINCE 1907



**CLASS 56**

Self-checking, automatic feeder-weigher for large tonnage; practically continuous stream delivery. Beam system has approval of all weighing authorities. Bulletin 2140-2.



**SELECT-O-WEIGH**

On electronic weight control system providing remote, instantaneous, dial-control formula changing and ingredient selection for all proportioning applications. Bulletin 0351.

8369



## STRETCH OUT YOUR STAINLESS, TOO

There *are* ways to stretch out your supply of stainless.

For example, you may be using a grade or finish of stainless that is in extreme demand when another similar one, not as tight, could do the job adequately.

Our metallurgical staff and stainless fabricating specialists are ready to help you look into this matter and to advise you on more readily-available types of stainless that will do a satisfactory job. Feel free to call on us for this specialized help.

**CRUCIBLE**

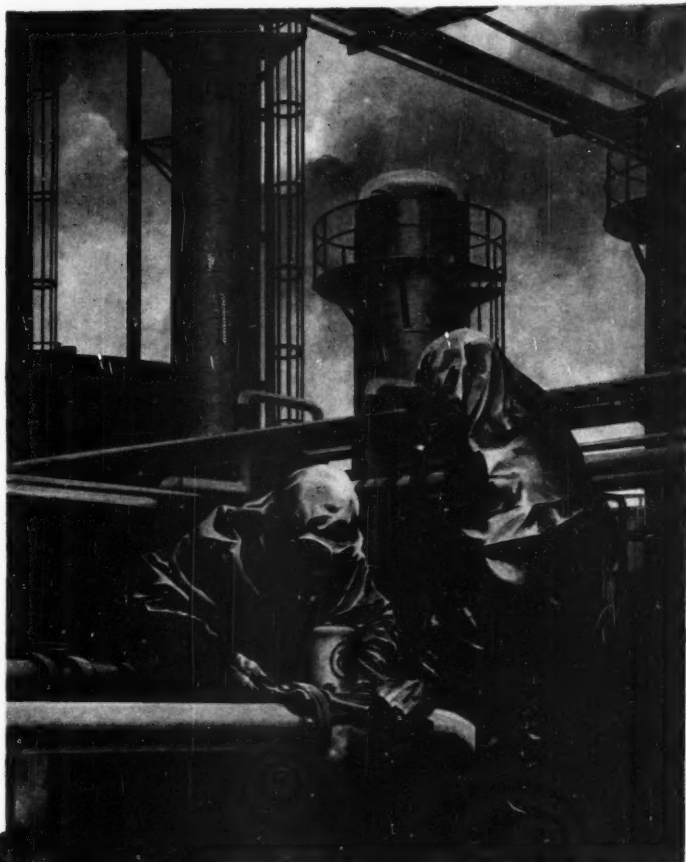
first name in special purpose steels

52 years of *Fine* steelmaking

**STAINLESS STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.  
REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

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MAKING  
AVIATION  
HISTORY?**



Not as spectacularly as the Wright Brothers, La Coste, or Lindbergh, but Cameron has helped make aviation history, too. When the need for aviation gasoline became critical during the war, and again in the last year or two, alkylation units sprang up almost overnight. With them came the need for valves to handle the corrosive catalysts—hydrofluoric and sulfuric acid. The Cameron Non-Lubricated Lift-Plug Valve was designed specifically for that service. Test installations quickly proved that the lift-turn-reseat principle of this valve, which requires no lubricant, together with its separate, renewable seat which permits any desired trim to resist corrosion, was ideal for alkylation service. The advantages of this remarkable valve have since been recognized by all divisions of the petroleum, chemical, and process industries.

Why not profit by this years ahead design in your operations?

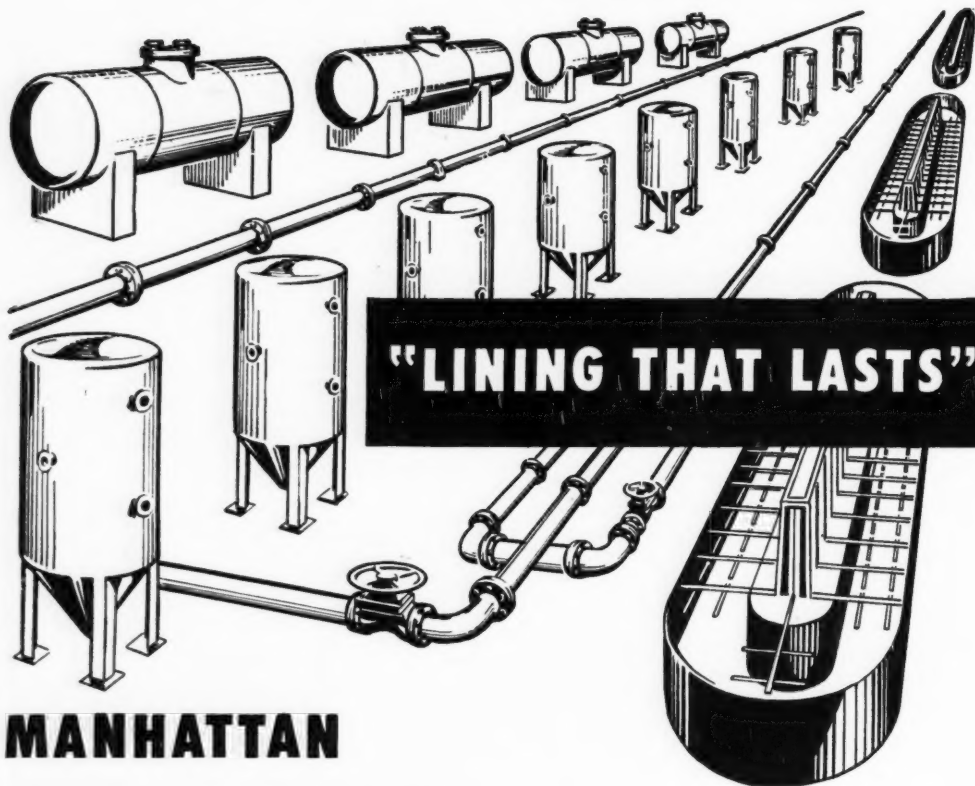
*World Leader in  
Pressure Control*

C. I. W., Inc., P. O. Box 1212, Houston, Texas  
Export: 7912 Empire State Bldg., New York, N. Y.

*Cameron*

**IRON WORKS**  
INCORPORATED





**"LINING THAT LASTS"**

## **MANHATTAN RUBBER LINING**

How can you be sure your costly steel equipment for processing is permanently protected from corrosion? Manhattan rubber lining engineers have the answer . . . They have developed a method of bonding rubber to metal so securely that tests prove it can't be pulled off • Manhattan Rubber Lining also expands and contracts with metal under temperature changes without hardening or cracking. It withstands the normal knocks of usage. This means protection from contamination in chemical processing . . . and in metal plating it means elimination of stray currents that might otherwise be dangerous. The resistance of Manhattan rubber lining to most acids, caustics and alkalis is practically ageless.

**CALL MANHATTAN FOR "LINING THAT LASTS"**

**RUBBER LINING PLANTS AT PASSAIC, N. J. AND NORTH CHARLESTON, S. C.**

**MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY**

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Hose



Roll Covering

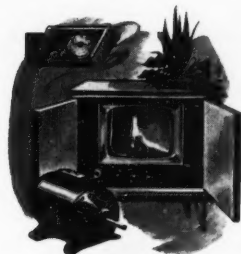


Tank Lining

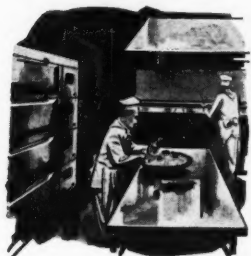


Abrasive Wheels

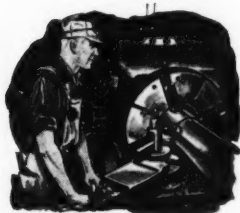
Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks  
Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls



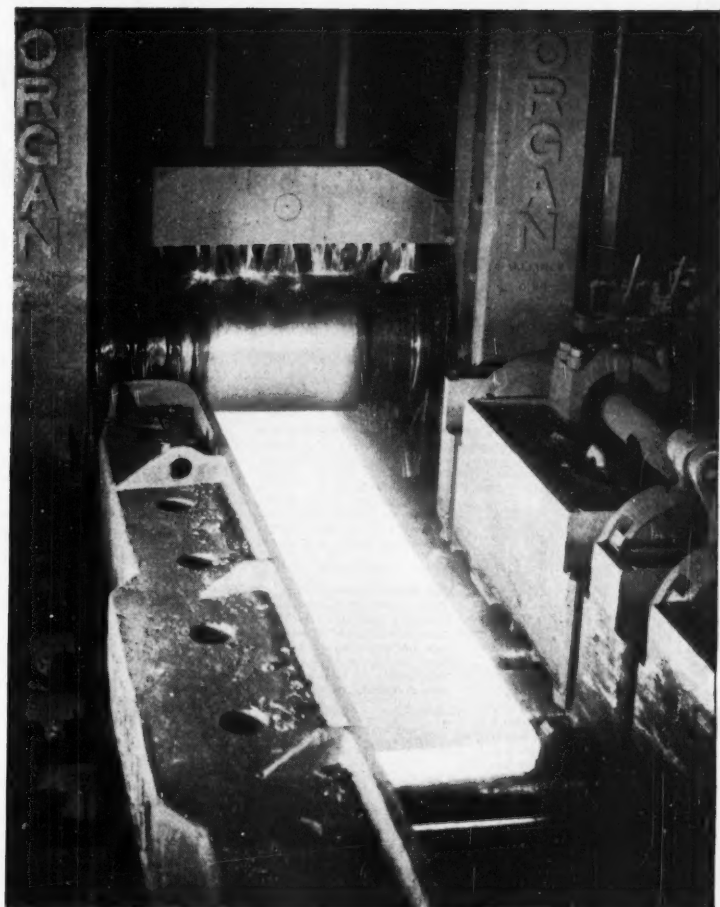
SPECIAL ELECTRICAL ALLOYS



CORROSION and HEAT-RESISTANT STEELS



TOOL and DIE STEELS



## *Coming at you —* One of the Royal Family of Steel

Our niche in the economic health of this nation in peace, and its defense in war, is to develop and produce the high-alloy steels and other special alloys which will do what ordinary metals cannot even approach in resisting corrosion, heat and wear, and in performing vital electrical and electronic chores. Whenever you have problems in these fields, the place to come is Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.

**PIONEER** in Specialloy Steels  
**Allegheny Ludlum**



# Don't shop around for *Corrosion-resisting* VALVES

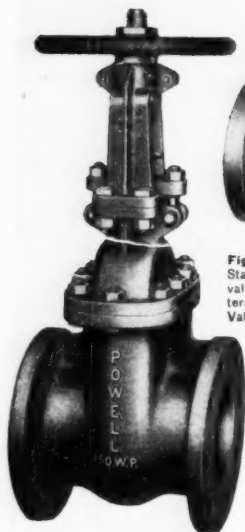


Fig. 2453-G—Large size 150-pound Stainless Steel O. S. & Y. Gate Valve. Precision-fitted, accurately guided, interchangeable solid or split wedge. Made with separable yoke arms in sizes 5" to 30", incl. Conforms to all the latest standards. Available in a wide selection of other corrosion-resisting metals and alloys.

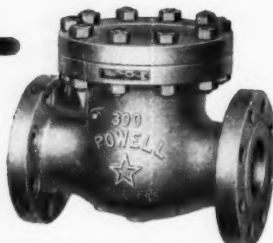


Fig. 3061 S. S.—Large size 300-pound Stainless Steel Swing Check Valve. These valves, made from heavy steel valve patterns, conform to A.S.A. and A.P.I. Steel Valve Standards, with flange dimensions in accordance with A.S.A. B-16e. Available for 150 through 2500 pounds W. S. P., in various corrosion-resisting metals and alloys.

Fig. 2475—150-pound O. S. & Y. Globe Valve. The stem is threaded and guided through a bushing screwed into upper yoke which has a compression lubricant fitting. Seat and plug type disc easily reground if necessary. Conforms to latest standards. Available in a wide range of corrosion-resisting metals and alloys with bolts and nuts in stainless steel. Also with screwed ends.



Fig. 1944—Large 150-pound "Y" Valve with bolted flanged yoke-bonnet and outside screw stem. Available in a variety of corrosion-resisting metals and alloys.

Possibly by going to enough different sources you can fill all your requirements for corrosion-resisting valves. But that's doing it the hard way and it certainly leads to confusion—in your maintenance department, in stocking spare parts and in many other ways.

Fortunately Powell makes valves of the right designs and materials\* to handle all the corrosive fluids encountered in the Chemical and Process Industries. So why look further?

**The Wm. Powell Co., Cincinnati 22, Ohio**

\*Available in the greatest variety of corrosion-resisting Metals and Alloys ever used in making valves.



Fig. 1832—200-pound Stainless Steel Gate Valve. Screwed ends, screwed-in bonnet, inside screw rising stem. Available in many other corrosion-resisting metals and alloys.

## Powell Corrosion-Resisting Valves are made in these Metals and Alloys

Stainless Alloys	Cast Irons	Nickel and Nickel Alloys	Bronzes—Acid, Aluminum, Silicon	Alloy Steels
18-8S	Cast Iron	Nickel	Everdur	Carbon Steel
18-8S Mo.	3% Nickel Iron	Monel Metal*	Herculoy	4-6% Cr. 5% Mo.
18-8S Co.	Ni-resist*	Inconel*	Ampco††	3.5% Nickel Steel
Misco "C"		Hastelloy Alloys†	Ampcoloy††	6-8% Cr. 5-7.5% Mo.
Durimet 20	Aluminum	(A, B, C and D)	76	8-10% Cr. 1.1-1.5% Mo.
11-5-13.5% Cr. Iron	Alcoa No. 43	Ilium	90-10	
18% Cr. Iron	Alcoa No. B-214	D-10	88-10-2	Silver Hard Lead
28% Cr. Iron	Alcoa No. 61 S-T			Molybdenum
25% Cr. 12% Ni.				

\*Registered trade-names of the International Nickel Co., Inc.

†Registered trade-name of the Haynes-Stellite Co. ††Registered trade names of Ampco Metal, Inc.

# POWELL VALVES

In Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys.

# What every Chemical Engineer should know about Pressure Filters

Pressure filters are probably the most commonly used filters in the processing industries and are, with few exceptions, intermittent or batch filters. Although there are many types of pressure filters on the market—disc, porous stone, cartridge, etc.—the plate-type and leaf-type are the most generally used for medium- and large-scale operations.

## PLATE-TYPE FILTERS

The best known and most widely-used of the plate-type is the plate-and-frame filter press which usually employs filter cloth as a base for the filter cake. Also well known are the horizontal-plate filters which have certain definite advantages in small sizes for handling relatively small-batch operations, but which are high in cost and unnecessarily bulky when large filter areas are required.

## LEAF FILTERS

There are many different types of pressure-leaf filters, such as the horizontal leaf, rotating leaf, and vertical leaf. Probably the simplest in design and most practical in application is the Niagara vertical leaf filter, employing all-metal filter leaves covered with permanent, fine-mesh wire filter cloth with openings small enough to quickly take a precoat of even the finest commercial filter-aids.

Limitations of this filter are that (1) It is a clarifying filter and cannot efficiently handle slurries with high percentages of solids; (2) It is not ideally suitable where the cake, not the liquid, is valuable.

However, it is ideally suited to most applications where plate-and-frame presses and other pressure filters are used for clarification purposes. Designed to combine most of the advantages of these other filters, it overcomes many of the disadvantages, particularly of the filter press, such as excessive time and labor for cleaning, poor cake-washing characteristics, bulky construction, uneven pressure distribution over total area, product leakage, non-uniform precoating, etc.

## ADVANTAGES

Main advantages of Niagara Filters are:

- (1) Totally enclosed, high-pressure filtration.
- (2) Elimination of all labor and expenses connected with handling, washing, replacement, etc., of filter cloths.
- (3) Higher rates of flow per unit filter area.
- (4) Complete, sparkling filtrate clarity.
- (5) Excellent cake-washing characteristics (almost true displacement washing).
- (6) Greatly reduced floor space requirements.
- (7) Rapid, easy cleaning and cake removal.
- (8) 100% corrosion-resistant alloy metal construction . . . stainless steels, other metals if required, at reasonable cost.
- (9) Easily jacketed for high-temperature operation.
- (10) Maintenance almost eliminated, since there are no moving parts.
- (11) One-man operation and handling, even of a battery.
- (12) Unit filter area up to 500 square feet.
- (13) Lower first cost where corrosion-resistant materials are required.

## LOW OPERATING COST

This filter, although relatively new in its application to the chemical and processing industries, is rapidly replacing many of the traditional, old-style pressure filters. This trend is the result of an increasing tendency to use corrosion-resistant equipment and the realization by plant operators that lower equipment operating and maintenance costs must be achieved to keep profits up in the squeeze between increased labor and material costs and an increasingly competitive price situation.

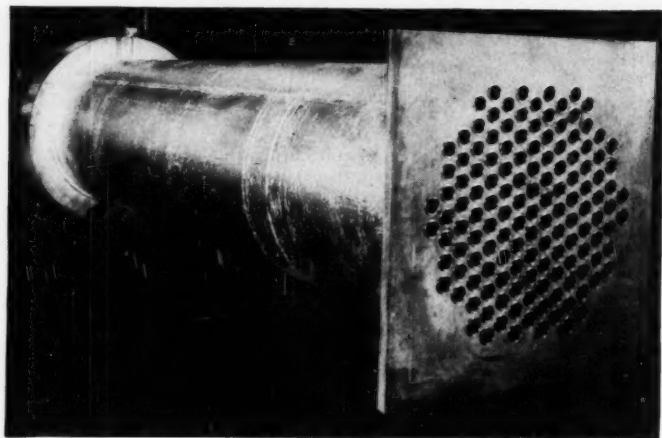
For additional data and information on the Niagara pressure-leaf filter, the new self-cleaning "Auto-Sluice" filter, and Niagara's pilot filter rental service, write Niagara Filter Corporation, 3087 Main St., Buffalo 14, N. Y.

IN EUROPE — NIAGARA FILTERS EUROPE, 36 Leidsegracht, Amsterdam-C, Holland

BRIDGEPORT BRASS COMPANY  
CONDENSER AND HEAT EXCHANGER TUBE EDITION  
**COPPER ALLOY BULLETIN**



MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL



Ammonia condenser equipped with 2" O.D. Duplex Tubes steel outside, Admiralty Brass inside.  
Courtesy Ohmstead Machine Works, Beaumont, Texas.

## Refrigeration and Air Conditioning

Mechanical refrigeration and air conditioning have widely penetrated domestic, industrial, processing, chemical, and refining fields bringing many problems involving the handling of corrosive gases and liquids.

### Freon and Methyl Chloride Refrigerants

For Freon or methyl chloride refrigerants that are in a dry condition, copper and copper-base alloys have proved to be most satisfactory from the standpoint of corrosion resistance and long life. On the cooling water side, arsenical Admiralty 30 stands up well in contact with low velocity sea water. On the fresh water side or where air is the cooling medium, copper is very satisfactory.

If there is a possibility of impingement corrosion because of high sea water velocities, Aluminum Brass 54 is superior to Admiralty 30. For extremely high sea water velocities one of the Cupro Nickel alloys is recommended.

### Ammonia Refrigerant

Although dry ammonia gas is not corrosive to many metals and alloys, the corrosiveness of liquid or gaseous ammonia is greatly increased by the presence of water and oxygen or air.

Furthermore, ammonia combined with moisture and air is one of the most important factors contributing to stress corrosion cracking of many copper-base alloys. Stress corrosion cracking is a highly localized form of attack resulting in deep, narrow, penetrating cracks in stressed metals.

On the other hand, low carbon steel tubes are very resistant to both anhydrous and moist, liquid or gaseous ammonia. This explains their wide use in the construction of equipment handling ammonia. However, steel tubes and pipes are subject to corrosion from the brine, sea water or fresh water side. This shortcoming can easily be overcome through the use of Duplex Tubing, consisting of copper or copper-base alloy to the water side and low carbon steel to the ammonia side.

### Duplex Tubes

Because of the above, Duplex tubes are finding wide application for ammonia refrigeration and for equipment producing ammonia and its compounds.

The most popular Duplex combinations are low carbon steel to the ammonia side, with Copper, Admiralty 30, or Red Brass 85 to circulating fresh water from rivers, lakes, ponds and wells. Where sea water is used for cooling purposes, 90-10 Cupro Nickel 510,

80-20 Cupro Nickel 520, 70-30 Cupro Nickel 531 (when available), Duralonze IV 53 (Arsenical Aluminum Bronze), Aluminum Brass 54 and Admiralty are preferred to copper because of their greater corrosion resistance. When the velocity of the sea water is comparatively high, Cupro Nickel, Duralonze IV and Aluminum Brass are preferred because of their greater resistance to impingement corrosion.

### Duplex Tubes Improve Heat Transfer Characteristics

Experiments have shown that Duplex tubes made up of steel and copper or a copper-base alloy show superior heat transfer characteristics than straight steel tubes. Replacement of corroded steel tubes in ammonia condensers with steel/copper Duplex tubes has shown up to 25% reduction in power costs and require fewer tube cleanings. Also the use of Duplex has resulted in smaller size heat exchangers having the same total heat transfer as a larger size unit equipped with regular steel tubes.

It is especially important to have a tight joint in any ammonia system. A small leak may contaminate the cooling water or brine, thus accelerating corrosion of the copper or copper-base alloy.

### Advantages of Duplex Tubes

Briefly the use of Duplex Tubing has many advantages:

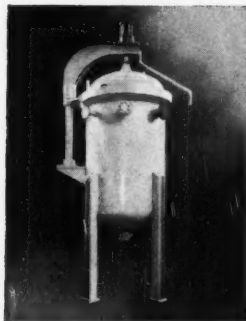
- (1) They do an excellent job where a dual corrosion problem is involved.
- (2) Over a period of time, maintenance is considerably reduced.
- (3) During periods of copper shortage, copper has been conserved or its use extended through the use of Duplex Tubing.
- (4) Fine for untreated raw waters which are corrosive towards low carbon steels and stainless steels.
- (5) Give greater corrosion resistance to treated waters.
- (6) Frequently give markedly improved heat transfer characteristics.
- (7) Can sometimes use a thinner wall Duplex tube than that of a regular tube.

Much information on Duplex tubes is given in Bridgeport's "Duplex Tubing Technical Bulletin No. 1950". Contact our nearest sales office for your tube requirements. (9083)

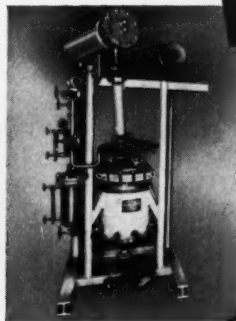


**Standard or Special  
Large or Small...**

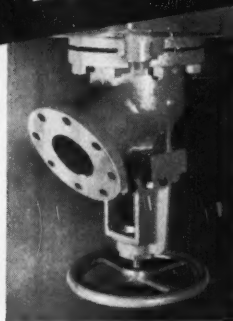
**BLAW-KNOX  
BUILDS THEM ALL!**



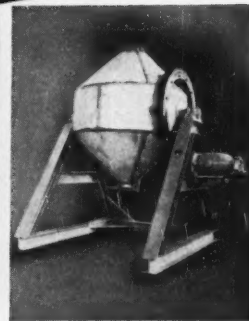
Special Vertical Autoclave  
for curing safety glass.



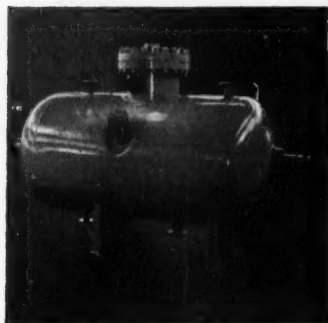
Electro-Vapor® Heated  
Resin Pilot Plant



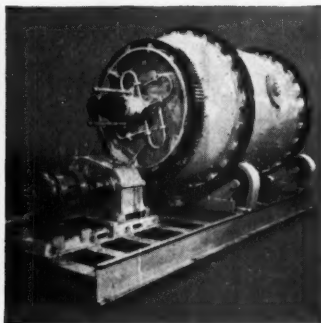
Flush Type Plug Valve



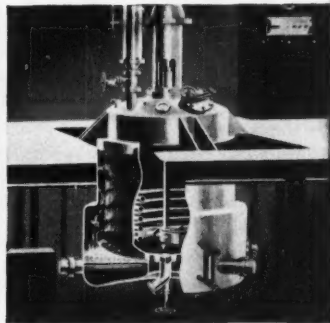
Stainless steel Granulation  
Blender



Horizontal Jacketed Autoclave  
with helical type agitation.



Jacketed Rotary Carbonator



Cut-away view of Electro-Vapor®  
heated Reaction Kettle.

**EQUIPMENT FOR:**  
Distillation • Cracking  
• Gas Cleaning • Sol-  
vent Extraction • Solvent  
Recovery • Heat Transfer  
• Gas Absorption • Poly-  
merizing • Evaporation •  
Crystallization • High  
Pressure Processing •  
Impregnating  
and other processes

Do you need a 1/2-gallon laboratory autoclave? Or a commercial unit of several hundred gallons capacity? Blaw-Knox has the extensive manufacturing facilities and engineering experience to furnish processing equipment which will meet your requirements in every respect. In addition to standard units we also fabricate special equipment to specifications. For further information write for Bulletin 2383.

PROCESS EQUIPMENT DEPARTMENT  
**BLAW-KNOX DIVISION** of Blaw-Knox Company  
2090 Farmers Bank Bldg., Pittsburgh 22, Pa.  
Other Offices in Principal Cities

**BLAW-KNOX PROCESS  
EQUIPMENT**

**How to add months  
... even years to  
equipment life!**

## **This Super Stainless Gives You New Freedom From Corrosion!**

When you're faced with a severe corrosion problem, investigate the super corrosion resistance of Carpenter Stainless No. 20. This sulphuric acid resisting Stainless can often reduce shutdown time and add substantially to equipment life.

If you are familiar with this alloy in its cast form, known as Durimet 20\*, you can appreciate Carpenter No. 20's superior resistance to sulphuric acids, plating and pickling solutions, mixed acids, etc. Now that Carpenter has solved the problem of producing this Stainless in rolled forms such as bars, wire, strip and tubing, the alloy is enabling industry to add months—even years to equipment life.

Of course, because of No. 20's high nickel content, there isn't always enough to "go around". Yet many engineers tell us they're planning now to use No. 20 as soon as possible to improve corrosion resistance in their products and reduce shutdowns. For help in your product planning work get the new Carpenter Stainless No. 20 Book. In addition, start now to discover for yourself the far-reaching advantages of No. 20. We'll be glad to provide test coupons and work with your engineering staff.

# **Carpenter**

## **STAINLESS NO. 20**

The Carpenter Steel Company • 127 W. Bern St. • Reading, Pa.  
Export Department: The Carpenter Steel Co., Reading, Pa.—"CARSTEELCO"

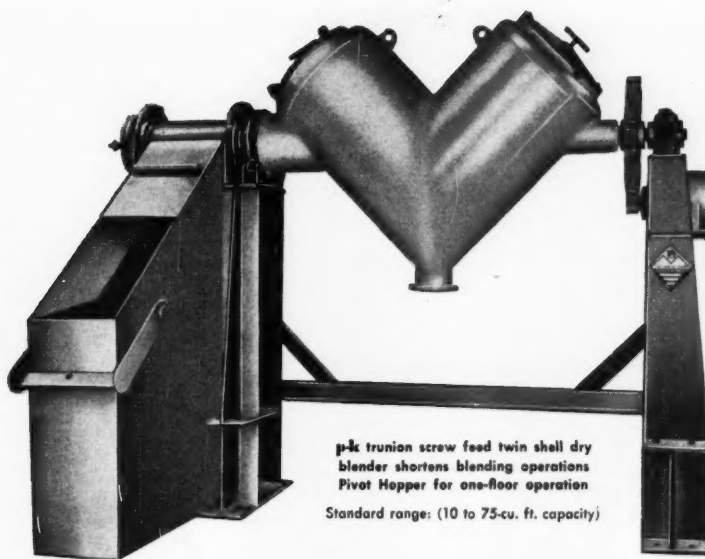
**Pioneers in Improved Tool, Alloy and Stainless Steels Through Continuing Research**



### **Imagine What Corrosion Resistance Like This Can Mean To You!**

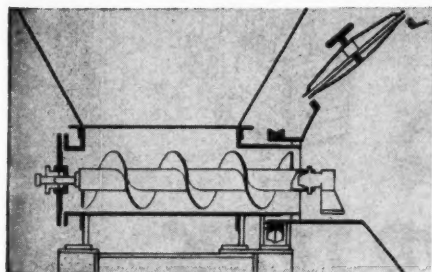
The problem here was to find a material that would stand up in nozzles used to fill storage batteries with electrolyte. Special fixtures were used to handle 12% sulphuric acid (specific gravity 1.080) at temperatures from 70°F to 130°F. Hard rubber nozzles broke frequently—and shutdowns for replacement often ran as high as 30 minutes. Even 18-8 Stainless nozzles, while solving the breakage problem, corroded so badly they lasted only 2 weeks (see 18-8 nozzle on right of photo). Then Carpenter No. 20 was put to work. After they had been in use for many months, nozzles made from No. 20 showed no signs of corrosion (see No. 20 nozzle on left of photo).

\*Carpenter Stainless No. 20 is licensed under The Durimet Company, Inc., U.S. Pats. 2,134,670; 2,185,987 and 2,200,208.



**p-k trunion screw feed twin shell dry  
blender shortens blending operations  
Pivot Hopper for one-floor operation**  
Standard range: (10 to 75-cu. ft. capacity)

## Now! Dry blending is even faster



**p-k trunion screw feed fixed hopper  
for conveyor or through-floor operation**  
Standard range: (10 to 150-cu. ft. capacity)

The new **p-k** trunion-feed, twin shell dry blender is faster because: Hopper can be loaded while blending is in progress permitting semi-continuous operation which speeds up the overall blending process. The blender is loaded directly from the hopper by a short, screw conveyor in a fraction of the time formerly required. All internal surfaces—shell, hopper and screw are quickly accessible for cleaning.

Gentle rolling-folding action assures rapid blending of powders, grains, pellets or flakes in any combination, thoroughly and without attrition.

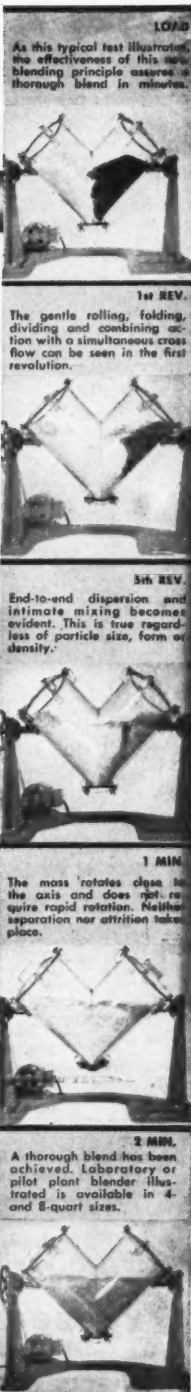
Dust tight loading ports eliminate dusting which results in a clean operation. All interior surfaces are baffle-free and are easily reached for thorough cleaning.

When your process planning includes a blending operation, it will pay you to ask **p-k** for blending tests on your materials and for engineering assistance at the initial planning stage. Since **p-k** also makes double-cone and ribbon blenders, an unbiased analysis of your blending methods is assured. Or, write for factual literature—Catalog No. 12.

© 1901

**the Patterson-Kelley Co., Inc.**

210 Lackawanna Ave., East Stroudsburg, Penna.



**LOAD**  
As this typical test illustration, the effectiveness of this new blending principle assures a thorough blend in minutes.

**1st REV.**

The gentle rolling, folding, dividing and combining action with a simultaneous cross flow can be seen in the first revolution.

**3rd REV.**

End-to-end dispersion and intimate mixing becomes evident. This is true regardless of particle size, form or density.

**1 MIN.**

The mass rotates clean to the axis and does not require rapid rotation. Neither separation nor attrition takes place.

**2 MIN.**

A thorough blend has been achieved. Laboratory or pilot plant blender illustrated is available in 4- and 8-quart sizes.



## MORE ROUND TRIPS

...with safety and savings

A Hackney 2-Piece Acid Drum will keep coming back for refills long after you would expect to retire a conventional 3-piece constructed container. That's because it is built stronger to last longer. Just look at these outstanding advantages, and see for yourself:

**I-Bar Rolling Hoops**—two 1" x 1½" hoops take the handling shocks—protect seam and bung from damage.

**Heavy Forged Spuds**—attached by a two-pass weld—minimize bung failures.

**Reinforced Chime Protectors**—add extra strength and life.

**Two-Piece Construction**—eliminates chime and longitudinal seams. Formed from two seamless, cold drawn shells, joined by a single-circumferential weld.

**Controlled Heat-Treating**—relieves weld and forming stresses—increases resistance to corrosion.

**Smooth Interiors**—free from crevices, cracks and scale—are always easy to clean.

Choose Hackney 2-Piece Acid Drums for safe, low-cost shipments of sulphuric acid, aqua ammonia, caustic potash, hydrofluoric acid or other special chemicals. Write for full details.

Write for a complimentary copy of our authoritative booklet, "Design for Progress."

## Pressed Steel Tank Company

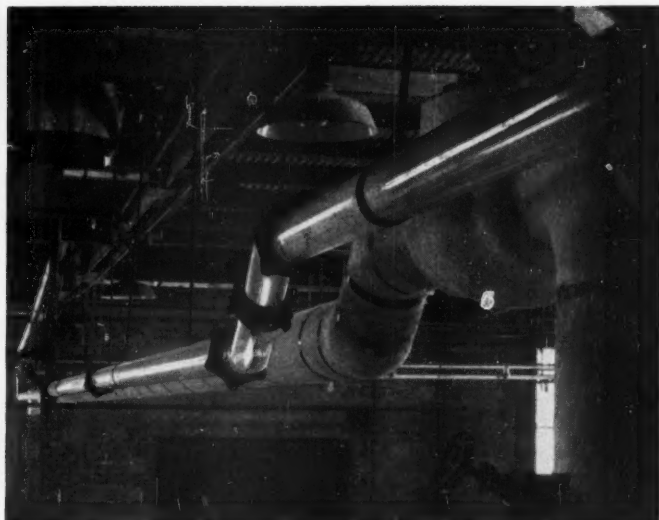
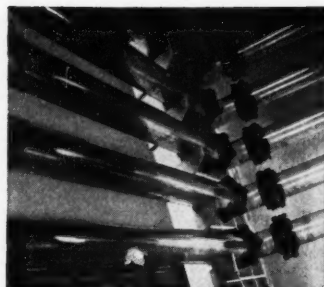


Manufacturer of Hackney Products

1447 S. 66th Street, Milwaukee 14 • 1325 Vanderbilt Concourse Bldg., New York 17 • 203 Hanna Bldg., Cleveland 15  
936 W. Peachtree St., N.W., Room 113, Atlanta 3 • 208 S. LaSalle St., Room 792, Chicago 4  
553 Roosevelt Bldg., Los Angeles 17



CONTAINERS FOR GASES, LIQUIDS AND SOLIDS



# What to consider

## IN SELECTING CHEMICAL PLANT PIPING

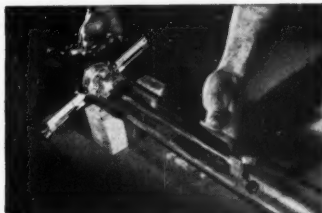
**I**N specifying process pipe it is important to give proper weighting to replacement costs, maintenance, ease of cleaning and the visibility of a process. That's why it may pay you to review these facts about PYREX brand "Double-Tough" glass pipe:

**Corrosion Resistance**—Glass pipe provides corrosion resistance to an extremely wide range of chemicals. It withstands the effects of *all* acids, except hydrofluoric, and can be used with all but exceptionally strong caustics.

**Visibility**—Only glass permits you to actually see what is happening—helps you to keep a continuous check on your process.

**Ease of Cleaning**—The glass-smooth surface of PYREX pipe assures simple rapid cleaning by flushing. There are no truncations or grooves in which deposits can collect to foul the pipe or to contaminate sensitive solutions.

**Rapid Assembly**—PYREX pipe and fittings are designed for rapid installation even by inexperienced help. Field plumbing kits permit you to make odd lengths right on the job as shown at right above.



Cutting odd length is simple

**Low First Cost**—The initial cost of PYREX pipe is definitely in line with that of other chemical piping materials—actually lower than most.

**Low Replacement Costs**—Not only corrosion resistance, but high resistance to both physical and thermal shock contribute to long service life. People respect glass, treat it carefully. Records prove that PYREX pipe is a genuine bargain.

**A**MONG the biggest and most enthusiastic users of PYREX pipe today are those who tried a small installation "just to see how it would work." Why not you? There is a PYREX pipe distributor near you. He carries the complete line, including all fittings. Corning will gladly send you his name on request. Use the coupon below.

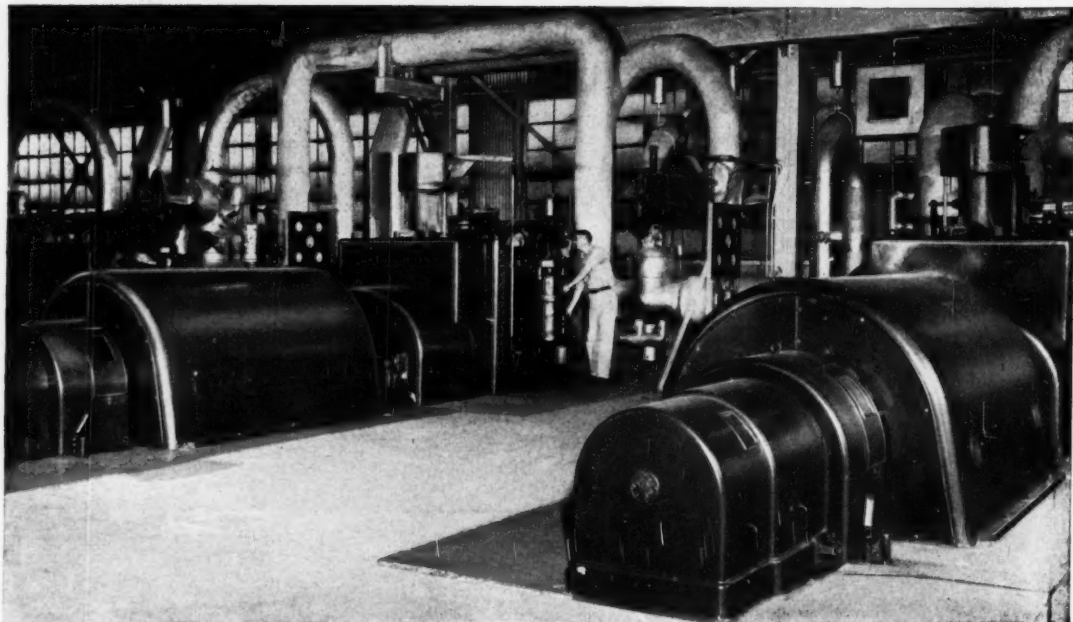
### CORNING GLASS WORKS Dept. CP-11, Corning, N. Y.

Please send me the printed information checked below:

- ☐ "PYREX brand "Double-Tough" Glass Pipe and Fittings" (EA-3)  
☐ "PYREX brand Glass Pipe in the Process Industries" (EA-1)

Name \_\_\_\_\_  
Title \_\_\_\_\_  
Company \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_  
Zone \_\_\_\_\_ State \_\_\_\_\_



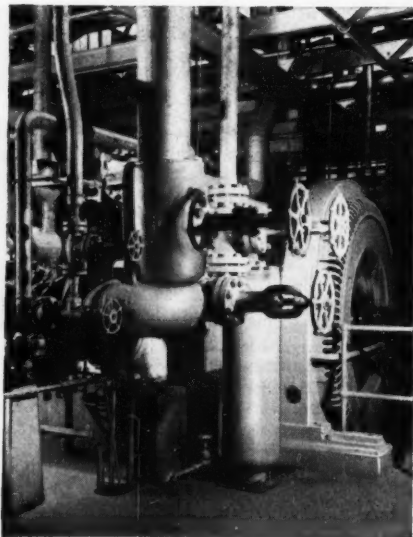


**EXTRA POWER, EXTRA PROCESS STEAM** is delivered by these 13,800-volt G-E turbine-generators. They utilize steam with high efficiency. Together with other turbine-generators in the plant, they furnish the electric power and all of the plant's process steam.

## How alkali plant saves 2 ways



**COMPACT, METAL-CLAD G-E SWITCHGEAR** in power plant at Saltville was easy to install, has saved inspection and maintenance time.

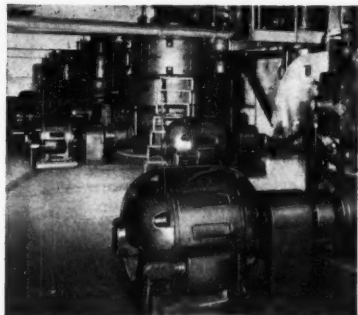


**PEAK DRIVE EFFICIENCY** in "dry-ice" building is provided by five 2300-v G-E synchronous motors that drive compressors.



**TO REDUCE COST** of feeders, transformers, and switchgear at Saltville, and to cut power losses, power is distributed at high voltage. Two of the G-E unit substations in foreground step down 13,800 volts to 2300 volts for plant distribution.

## with high-voltage power system



**HEAVY DUTY** 75-hp Tri-Clad\* motors drive coal pulverizers. Typical of many such drives in the plant.

\*Registered trade-mark of General Electric Company

### Mathieson's Saltville, Va. plant reduces line losses, cuts equipment costs with 13.8-kv power system

Each step in the electrical system of Mathieson's Saltville plant—generation and utilization—takes advantage of high-voltage power distribution.

Electricity generated by turbine-generators at 13,800 volts is distributed to the various utilization areas where it is stepped down in compact load-center unit substations. The need for long low-voltage feeders is ended. Voltage drop is lessened. Plant efficiency is increased. Installed cost

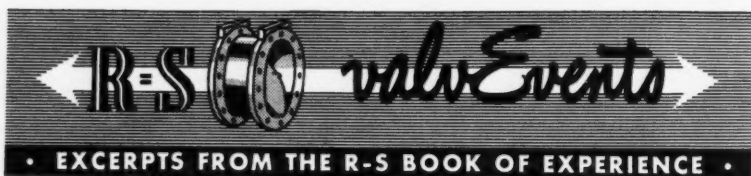
of the plant's electrical system is lower.

Integrating the Saltville plant's power system—planning it to function as one efficient unit—was the job of General Electric system engineers. They can provide the co-ordination you need for highest over-all electrical system performance. Contact your G-E Apparatus Sales representative early. *General Electric Company, Schenectady 5, N. Y.*

662-39

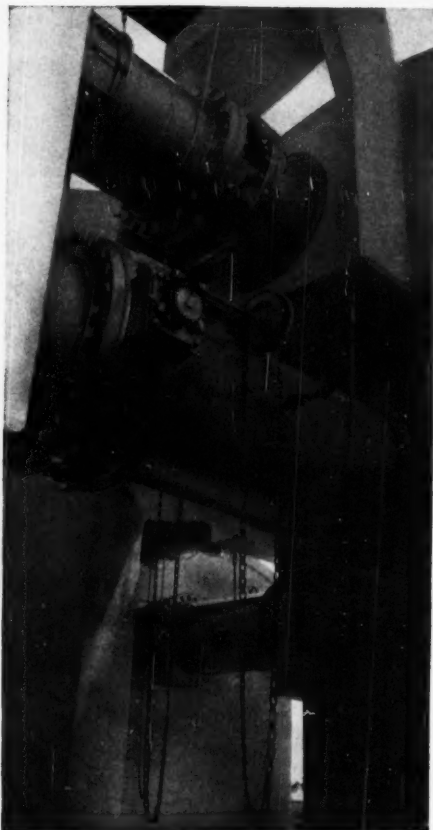
**Engineered electrical systems for chemical plants**

**GENERAL**  **ELECTRIC**



**For Operating Ease in Inaccessible Locations**

## **INSTALL R-S CHAINWHEEL VALVES**



**Few Chainwheel Turns.** R-S Valves are completely closed from the fully open position by the movement of the valve vane through  $77\frac{1}{2}^\circ$  of arc. Operating ease is one of the chief advantages of R-S Valves.

**Economy in First Cost.** R-S narrow face-to-face design results in minimum number of working parts, less metal, less machining, lower weight and less supporting structure—hence economy in first cost.

**Accurate Engineering.** Body assemblies are accurately engineered mechanically and metallurgically. A. S. A. standards are equaled or exceeded in every detail.

**Low Pressure Drop Saves Power.** In the open position the streamlined vane causes a Venturi action. Pressure drop is therefore exceptionally low. Pumping costs are reduced accordingly.

**More Control Rangeability.** Power-controlled prime movers delivering 15 foot-pounds to 38,000 foot-pounds of torque open or close at any desired speed. Full closure requires one second to ten minutes depending on requirements and the type of material controlled. Positive shut-off is obtained with a rubber seat.

**Self-cleaning.** There are no pockets to house sediment, no change of flow direction to create turbulence or wire drawing and therefore less likelihood of erosion and cavitation.

**Maintenance Practically Nil.** Every R-S Valve is designed and constructed for rugged service and provided with safety factors to give complete satisfaction in the service for which it is designed. Packing trouble is not common to R-S Valves since the shaft moves only with an oscillating motion.

Consult your local R-S Valve Engineers, or write direct.

**R-S PRODUCTS CORPORATION • 4600 Germantown Ave., Philadelphia 44, Pa.**

*An S. Morgan Smith Company Subsidiary*

**DISTRICT OFFICES IN PRINCIPAL CITIES**

So tough you can  
drive a nail with it!



## USCOLITE... U. S. Rubber's famous plastic

This plastic pipe is unbeatable in impact strength. For example, a .44 cal. revolver bullet, fired at a distance of 20 yards, scarcely dented a section of Uscolite piping. This remarkably strong and versatile plastic is resistant to most industrial chemicals. It is lightweight, easy to handle.

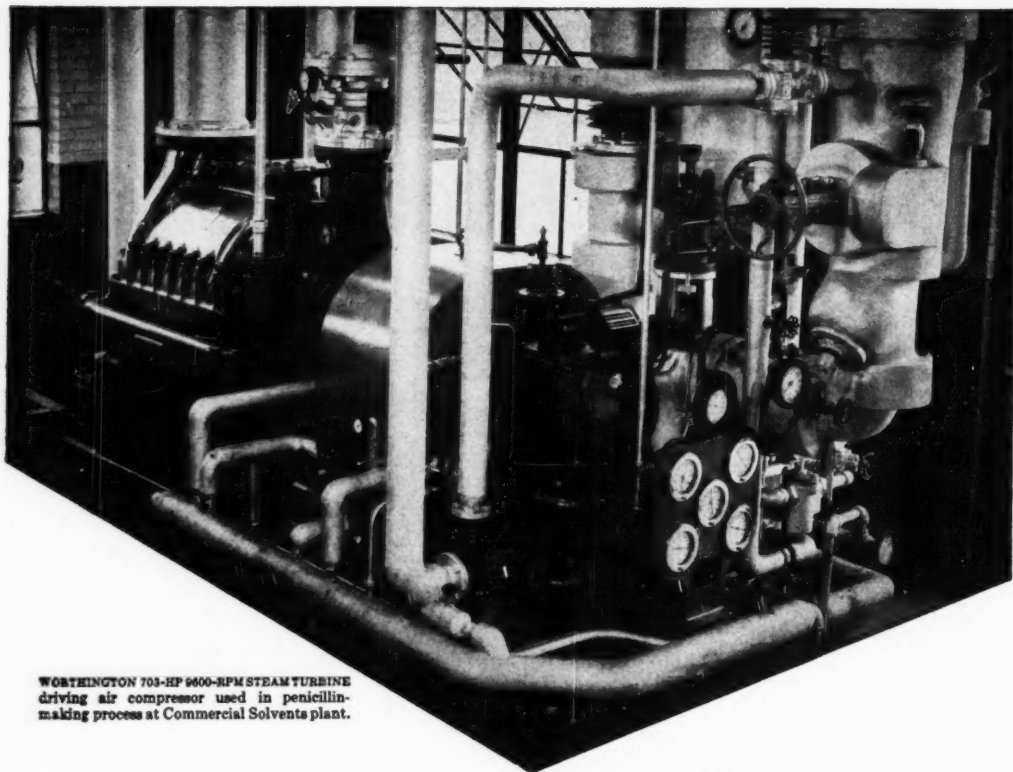
Furnished in standard lengths, Uscolite pipe can be cut and threaded with standard equipment. A complete line of Uscolite fittings is also available, enabling contractors to do a complete on-the-job assembly and installation. For further information, write to address below.

PRODUCT OF



**UNITED STATES RUBBER COMPANY**  
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.





WORTHINGTON 703-HP 9600-RPM STEAM TURBINE driving air compressor used in penicillin-making process at Commercial Solvents plant.

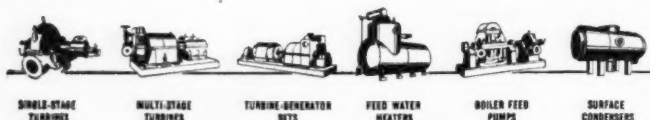
# 9600-rpm turbine drives compressor in making penicillin for Commercial Solvents Corp.

Two years ago, a Worthington high-speed steam turbine was installed in the Terre Haute, Indiana, penicillin plant of Commercial Solvents Corporation. Its high efficiency and economical steam consumption plus its low maintenance demands have justified that selection many times over.

In addition, use of Worthington high-speed, direct-drive turbines to drive centrifugal compressors or blowers makes possible a broad speed range, elimination of costly speed increasing gears, and adaptability to various governing arrangements for precise control under all operating conditions. Worthington's design flexibility provides you with the *right* type and size turbine for optimum performance—regardless of your requirements.

Remember, when you're considering turbines for driving compressors, the engineering of the turbine is just as important as the engineering of the compressor. Worthington's long and complete experience in compressor-drive engineering is your assurance of maximum efficiency. Write for Bulletin 1666 to Worthington Corporation, Steam Turbine Division, Wellsville, N. Y.

T-2-19



SINGLE-STAGE  
TURBINES

MULTI-STAGE  
TURBINES

TURBINE-GENERATOR  
SETS

FEED WATER  
HEATERS

BOILER FEED  
PUMPS

SURFACE  
CONDENSERS

A GREAT TEAM IN STEAM

## WORTHINGTON



Steam Turbines



*How do you know which*

# Positive Displacement Pump

*is right for your job?*

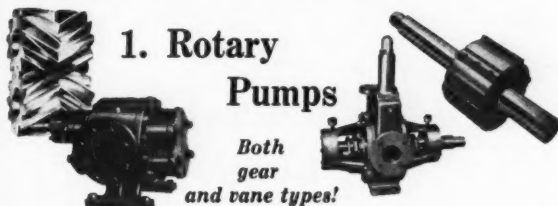
If you've ever suffered the consequences of a wrong choice in pumps, or if you're now making a choice and have some doubts, here's help.

GET THE ADVICE OF A PUMPING SPECIALIST—a manufacturer who makes *all* types of pumps—including all types of positive displacement pumps—and is in a position to treat your problem objectively without the desire to sell you one type over others.

Worthington — oldest and largest pump manufacturer in the world — is equipped to do exactly this for you. With the most complete pump line to choose from, we can always find the one that fits your particular service conditions.

Write and tell us about your pumping problems. Be sure to give all pertinent details! Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Reciprocating Pump Division, Harrison, New Jersey.

## The Worthington Positive Displacement Pump Line includes all these ...



### 1. Rotary Pumps

*Both  
gear  
and vane types!*

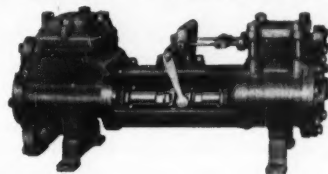
FOR VISCOUS LIQUIDS—SMOOTH, QUIET OPERATION. *Worthington Herringbone-Gear Pumps*, Types GA and GR; capacities from 1 to 5,000 gpm; pressures to 500 psi.

FOR NON-LUBRICATING, SLIGHTLY ABRASIVE OR CORROSIVE LIQUIDS. *Worthington Sliding-Vane Pumps*, Types VE and VR; external or internal bearings; capacities from 25 to 1,000 gpm; pressures to 200 psi.

### 2.

### Steam Pumps

*If you use steam,  
why not drive pumps with it?*

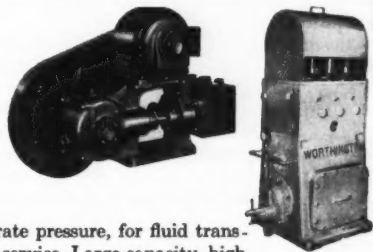


Steam ends up to 250 psi maximum working pressure, hydrostatically tested to 375 psi. Hot-oil or cold-oil fitted. Simplex and duplex. All types: large and small; low pressure, high pressure; for general, boiler feed, refinery, steam heating and evaporator service.

### 3.

### Power Pumps

*Up to 2,000 hp!*



Small capacity, moderate pressure, for fluid transfer, refinery or general service. Large capacity, high pressure, for pipeline and hydraulic service.



CENTRIFUGAL



ROTARY



STEAM



POWER



VERTICAL TURBINE

The World's Broadest Line Assures You the Right Pump for Every Job

**WORTHINGTON**

Reciprocating and  
Rotary Pumps

# Benzol Products Co. solves tough vacuum problem with Worthington Steam Jet Ejectors

*18 units installed since 1942  
for operation under extremely  
corrosive conditions*

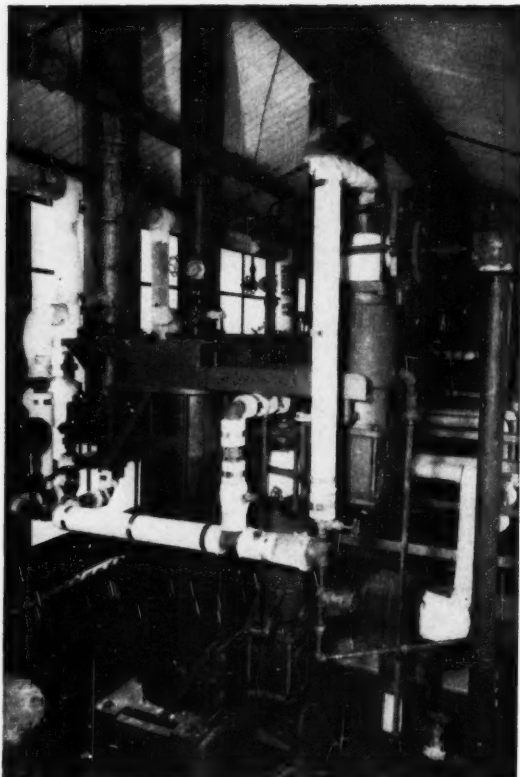
Benzol Products Company of Piscataway, New Jersey, had a real problem on their hands.

Until 1942, they were having extreme difficulty with maintenance and operation of their vacuum pumps due to the highly corrosive vapors resulting from their processes. In 1942, they replaced a vacuum pump with a Worthington corrosive resistant ejector, and it was so successful that they have now replaced all of the vacuum pumps for corrosive service with ejectors. Some of the units installed in 1942 and 1943 are still equipped with their original nozzles and diffusers—in spite of 24 hour-a-day, 6-day-a-week operation.

Corrosion—the one big problem—has been eliminated by the material from which these particular ejectors are made—impervious graphite.

Worthington's experience with ejectors dates back to 1918. And today, there's a Worthington model for every vacuum requirement—from atmosphere to 50 microns absolute, single and multiple stages, condensing and non-condensing, of stainless, bronze, porcelain, impervious graphite, Worthite, cast iron and steel.

Write and tell us about your specific requirements. Worthington Corporation, Steam Power Division, Ejector Section, Harrison, New Jersey.

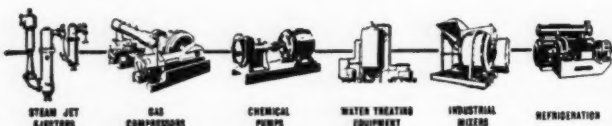


WORTHINGTON STEAM JET EJECTOR MADE OF IMPERVIOUS GRAPHITE for corrosion resistance. Installation at Benzol Products Company plant in Piscataway, New Jersey, used on vacuum service in production of synthetic allethrin. This three-stage unit operates at 2 mm Hg absolute.

## 6 Big Advantages of Steam Jet Ejectors for Vacuum Service.

1. Initial cost is low.
2. Operating costs are at a minimum.
3. Maintenance costs are negligible.
4. There are no moving parts.
5. Easy to operate.
6. They can be manufactured of any machinable material.

X.2.1



# WORTHINGTON



## Steam Jet Ejectors



## Cold for fatty acid crystals

Solvent crystallization is one of the important processes at Armour and Company's new chemical plant at McCook, Ill. The process is used to separate acids that contain the same number of carbon atoms and cannot be separated by fractional distillation.

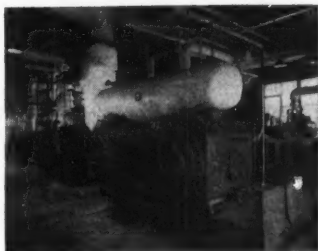
A vital part of this process is the Worthington refrigeration system consisting of two double-pipe stainless-steel chilling machines, a horizontal duplex two-stage ammonia compressor, horizontal duplex ammonia booster compressor, flu-gas compressor, and shell and tube equipment.

Armour is another in an ever-growing list of "big names" in the chemical industries who have chosen Worthington refrigeration.

Others include: B. F. Goodrich Chemical Co., Avon Lake, Ohio; Dow Chemical Co., Freeport, Tex.; Minnesota Mining and Manufacturing Co., St. Paul, Minn.; Lion Chemical Co., El Dorado, Ark.; E. I. DuPont de Nemours & Co., Edgemore, Del., Orange, Tex.; Shell Chemical Co., Houston, Tex.; Gulf Oil Corp., Port Arthur, Tex.; Rohm & Haas Co., Houston, Tex.

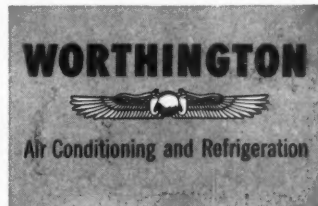
When these well-known companies look for refrigeration to be used in controlling a myriad of intricate reactions, they look for the best. Their choice is your best evidence that *there's more worth in Worthington.*

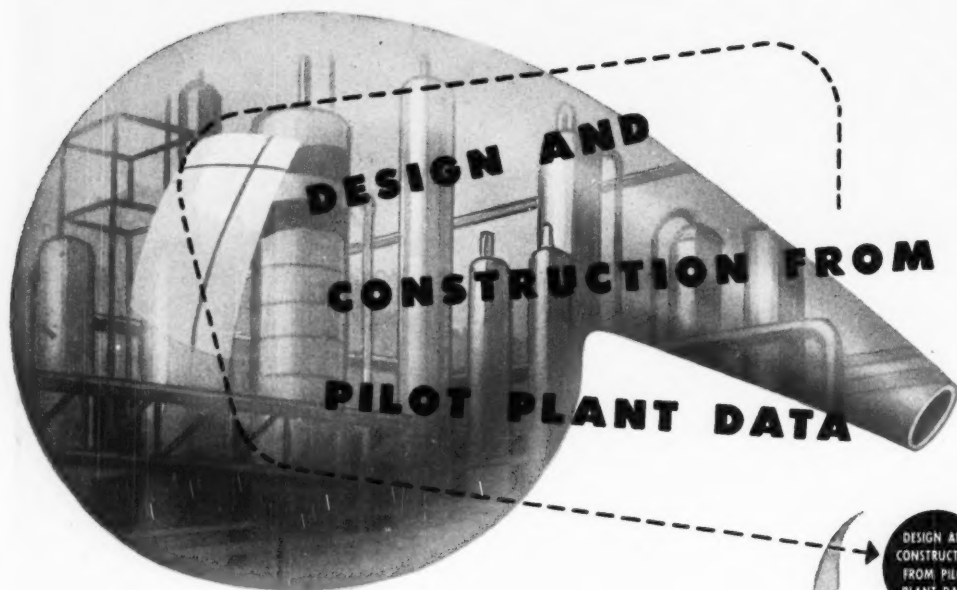
Worthington Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J.



WORTHINGTON HORIZONTAL DUPLEX, TWO-STAGE AMMONIA COMPRESSOR, part of the complete Worthington refrigeration system at Armour's McCook, Ill., chemical plant. System is unusual in that compressors are piped and instrumented to permit two levels of refrigeration—one at 5F., the other at -50F. Engineer and contractor: E. B. Badger & Sons Co., Boston, Mass.

A 2.29





From information gained during experimental work with the pilot plant, Wigton-Abbott engineers analyze the data, suggest any additional tests that may be necessary, develop the process and prepare engineering flow sheets. This is one phase of the 5-point service to the chemical industry offered by the Wigton-Abbott Corporation. It is the key to an integrated plan for the design and construction of a complete plant—a service available separately or as part of an overall project. Let us discuss your plant construction problem with you and show you how Wigton-Abbott can help you every step of the way.

5  
WIGTON-  
ABBOTT  
SERVICES  
TO THE  
CHEMICAL  
INDUSTRY

DESIGN AND  
CONSTRUCTION  
FROM PILOT  
PLANT DATA

PROCESS  
DESIGN FROM  
CLIENT'S FLOW  
SHEET

ECONOMIC  
SURVEYS AND  
ANALYSES

THE  
DEVELOPMENT  
OF A NEW  
PROCESS

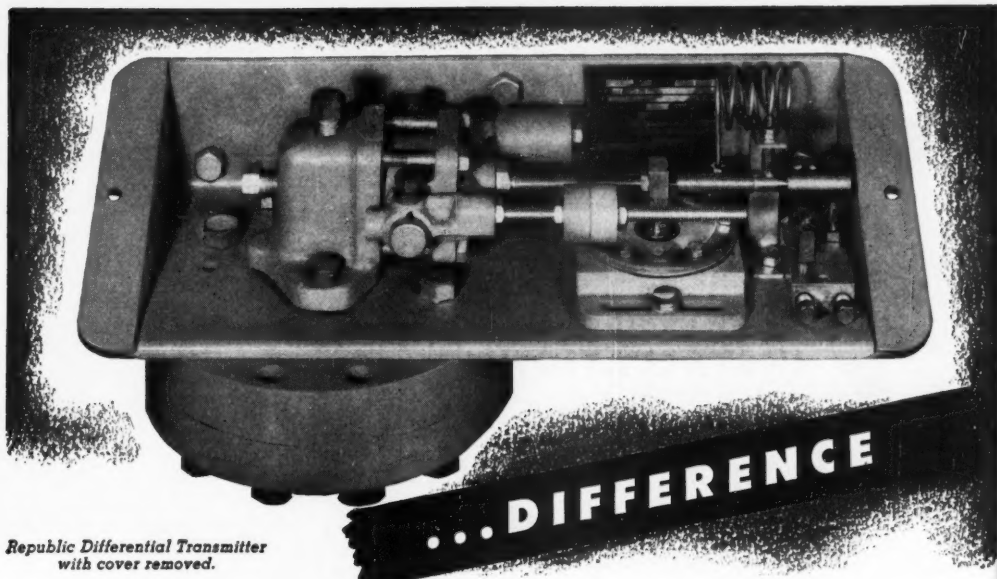
CONVERSION  
OF EXISTING  
FACILITIES



● *Yours for the asking*  
"Packaged Plant Construction".  
Reading time, only 10 minutes—  
but it will save you many hours  
by answering basic questions.

## Wigton-Abbott Corporation

DESIGNERS...ENGINEERS...CONTRACTORS...PLAINFIELD, NEW JERSEY



*Republic Differential Transmitter  
with cover removed.*

## Spells PLUS PERFORMANCE

The Republic Pneumatic Transmitter combines machine ruggedness with instrument precision to provide matchless performance in measuring flow, level, pressure or density of a wide variety fluids. By any or all of the following points, the Republic challenges comparison:

**ACCURACY** of the Republic force-balance principle is higher than can be consistently secured and maintained with any other method. 1/2 of 1% guaranteed.

**TEMPERATURE** variations of ambient atmosphere have negligible effect on the accuracy of the Republic transmitter.

**CHANGES IN AIR SUPPLY PRESSURE** do not affect the accuracy of a Republic transmitter to any significant extent. A 5 psi change produces an error of less than 1/10%.

**CHANGES IN LINE PRESSURE**—Republic differential transmitters are not affected by variations in line pressure. A patented and exclusive simple adjustment assures this protection.

**SENSITIVITY**—Due to the negligible motions required for complete operation of all parts, for a full scale change, no appreciable hysteresis results from reversal of direction of measurement change.

**VIBRATION** of any normal frequency has no effect on the Republic transmitter.

**LEVELING**—Since all parts are balanced, and no liquid is used for calibration, Republic transmitters need not be leveled exactly, and may be adjusted for installation in any position.

**FOR TWELVE YEARS** Republic Pneumatic Transmitters have delivered unmatched performance in every type of installation. Complete details of design and operation, plus numerous application suggestions are combined in Data Book, 1002. Send for your copy, today.

# REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois



# SIMPSON MIX-MULLERS assure

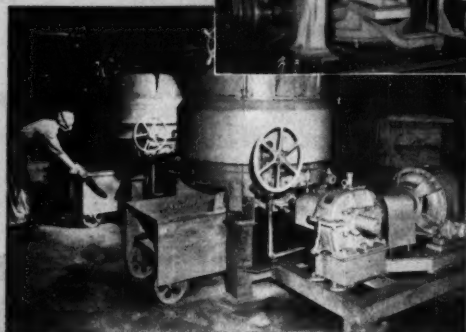
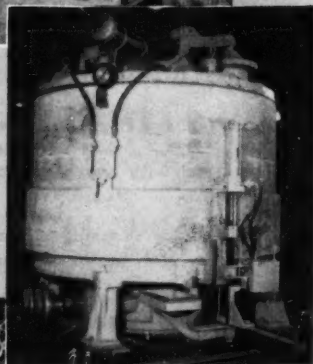
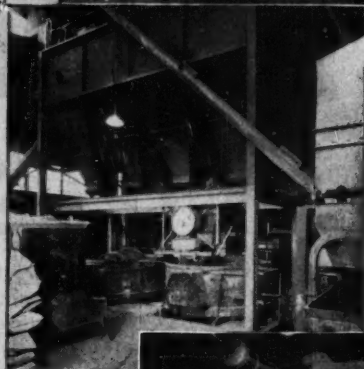
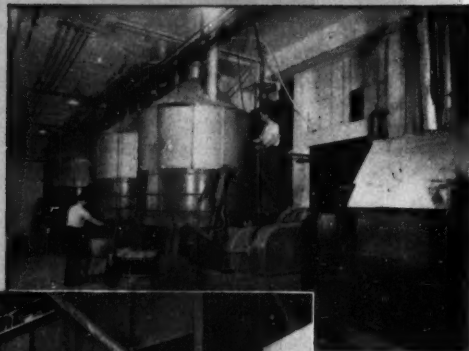
## 7 TYPICAL INSTALLATIONS giving daily proof of Better Performance

AT a time when industry is committed to its greatest effort, modern high-production equipment is vitally important. The seven Simpson Mix-Muller installations shown are representative of the way in which these high capacity machines serve the chemical-process industries.

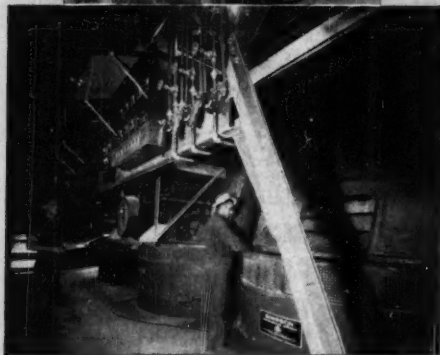
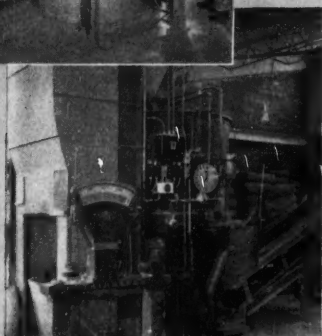
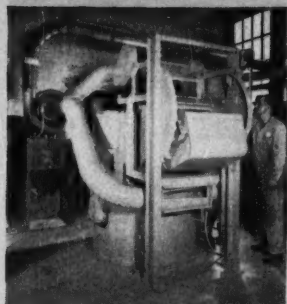
Here are carefully engineered mixers that have been proved superior in over 9,000 installations. Day-in and day-out operation has shown that blending is more accurate and thorough—the mixing cycle is shorter—and the cost per batch is considerably less, than in older mixing methods. Whether dry, semi-plastic, or plastic material is to be blended—the result is the same. That's because Simpson Mix-Mullers embody the *true mulling* principle of mixing.

### THE MULLING PRINCIPLE OF MIXING

The thorough mulling of Simpson Mix-Mullers is similar to the rubbing, kneading and smearing action of a mortar and pestle. The machine consists of a circular stationary pan, in which is mounted a special combination of mullers and plows that revolve. The mullers are adjustable and are supported on rocker arms so that they are free to ride on the material, creating pressure and an intensive rubbing and smearing action as they revolve. This eliminates any balling of material and quickly develops a maximum plasticity of the mix. No other method has ever proved more effective for fast, thorough, controlled mixing and blending.



# Controlled Mixing by *MULLING*



## MAKE THIS SIMPLE *Smear Test* YOURSELF

Place a small amount of the product you are now mixing on a ground glass and run a spatula through the center of the mass. If the batch is not thoroughly mixed and blended — you will find tell-tale lumps or smears which ordinary examination would not reveal.

The above illustration shows the actual result of a test on a product in which thorough mixing was very important. Notice the absence of blotches in the upper smear . . . the result of *mulling* in a Simpson Mix-Muller.

This thorough controlled mixing plus speedier, lower cost operation are ample reasons for deciding on Simpson Mix-Mullers.

Simpson Mix-Mullers are built in capacities ranging from 1/10 to 30 cu. ft. They may be specially equipped for heating or cooling while mixing — for mixing under vacuum or pressure — for corrosive materials — or to function as a reaction vessel.

Write for complete details covering the use of Simpson Mix-Mullers to meet your individual requirements . . . or send for a copy of our latest Chemical-Process Mixing Catalog.



## SIMPSON Mix-Muller® Division

NATIONAL ENGINEERING CO.

604 Machinery Hall Bldg., Chicago 6, Ill.





**TANKS**  
and vessels  
that are  
**CORRECT**  
in design

● Whatever your needs in pressure vessels—gas storage tanks, pressure spheres, creosoting cylinders, bubble towers, gas scrubbers, etc.—you can depend on Cole for tanks that are correct in design and permanently leak-proof at the welded or riveted joints.

We also design and fabricate elevated tanks, acid tanks, dye vats, digestors, standpipes, storage tanks, etc.

Write for latest Cole catalog—"Tank Talk."

Established 1854

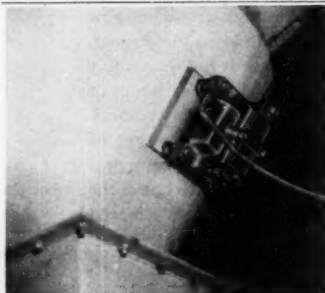
**COLE**

R. D.

NEWMAN, GEORGIA

MFG. CO.

ELEVATED TANKS • VESSELS • CYLINDERS  
TOWERS • BINS • STANDPIPES



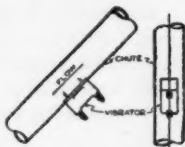
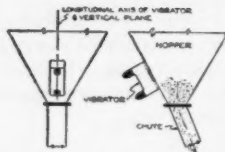
Assure Free-Flowing Bins,  
Hoppers and Chutes

with

**SYNTRON**

"Pulsating Magnet"

**ELECTRIC  
VIBRATORS**



They are designed to make your troublesome bins, hoppers, chutes free-flowing—to eliminate the arching and plugging of materials. Their 3600 pulsating vibrations per minute keep even the most stubborn materials flowing evenly, whether in a small 1-cu. ft. hopper or a big storage bin. Eliminate costly stoppages that waste manpower—

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610 Lexington Avenue

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**ANTHRAFILT\***

Is the  
**HARD COAL  
FILTER  
MEDIUM**  
that

**SAVES**  
IN  
many, many ways

You save in many ways when you use ANTHRAFILT\*... an outstanding hard coal filter now enjoying widespread use in industry. No water soluble constituents remain in ANTHRAFILT\* to contaminate or contribute tastes or odors to filtered solutions. The reason: practically all minerals other than the inherent ash are removed during preparation. Filters acetic and sulfuric acid, caustic soda solutions, boiler condensate, sanitary and process water.

**ANTHRAFILT\***

provides:

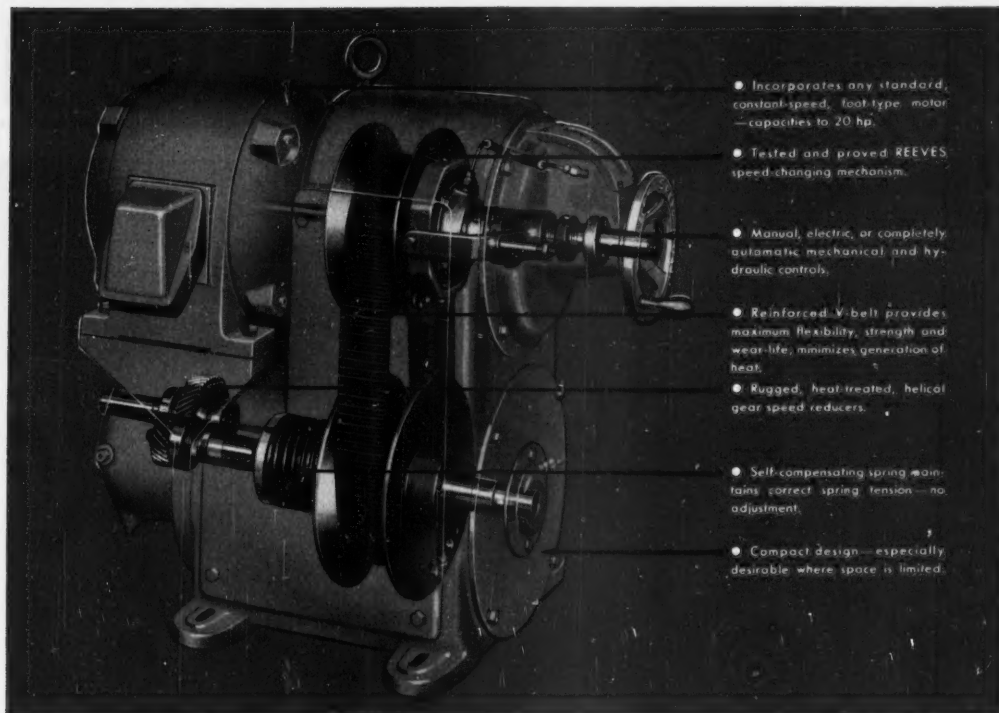
- GREATER CAPACITY
- LONGER FILTER RUNS
- CLEANER WASHINGS AT LOWER COST
- REMOVES ENTRAINED TURBIDITY FROM INDUSTRIAL PROCESS SOLUTIONS OR WASTES

We invite you to write us today for full details and recommendations. A prompt reply is assured.

**PALMER FILTER EQUIPMENT COMPANY**  
822 East 8th St., P. O. Box 1655, Erie, Pa.

\*Trade Mark Reg. U. S. Pat. Off.

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EQUIPMENT CORPORATION**  
Anthracite Institute Building  
WILKES-BARRE, PA.



- Incorporates any standard, constant-speed, foot-type motor—capacities to 20 hp.

- Tested and proved REEVES speed-changing mechanism.

- Manual, electric, or completely automatic mechanical and hydraulic controls.

- Reinforced V-belt provides maximum flexibility, strength and wear-life; minimizes generation of heat.

- Rugged, heat-treated, helical gear speed reducers.

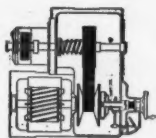
- Self-compensating spring maintains correct spring tension—no adjustment.

- Compact design—especially desirable where space is limited.

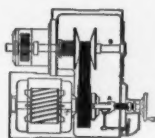
## Everything's built in—

*and built to give your machines trouble-free, stepless speed adjustability in the*

## REEVES Vari-Speed Motodrive®



Minimum Speed Position



Maximum Speed Position

**REEVES** Vari-Speed Motodrive utilizes proved REEVES operating principle of a V-belt driving between two pairs of cone-shaped discs which are adjustable to form an infinite number of driving and driven diameters. Discs are mounted on parallel shafts. One shaft receives power at constant speed from motor—other delivers power at infinitely adjustable speed to gear reducer from which desired speed is transmitted to driven machine.

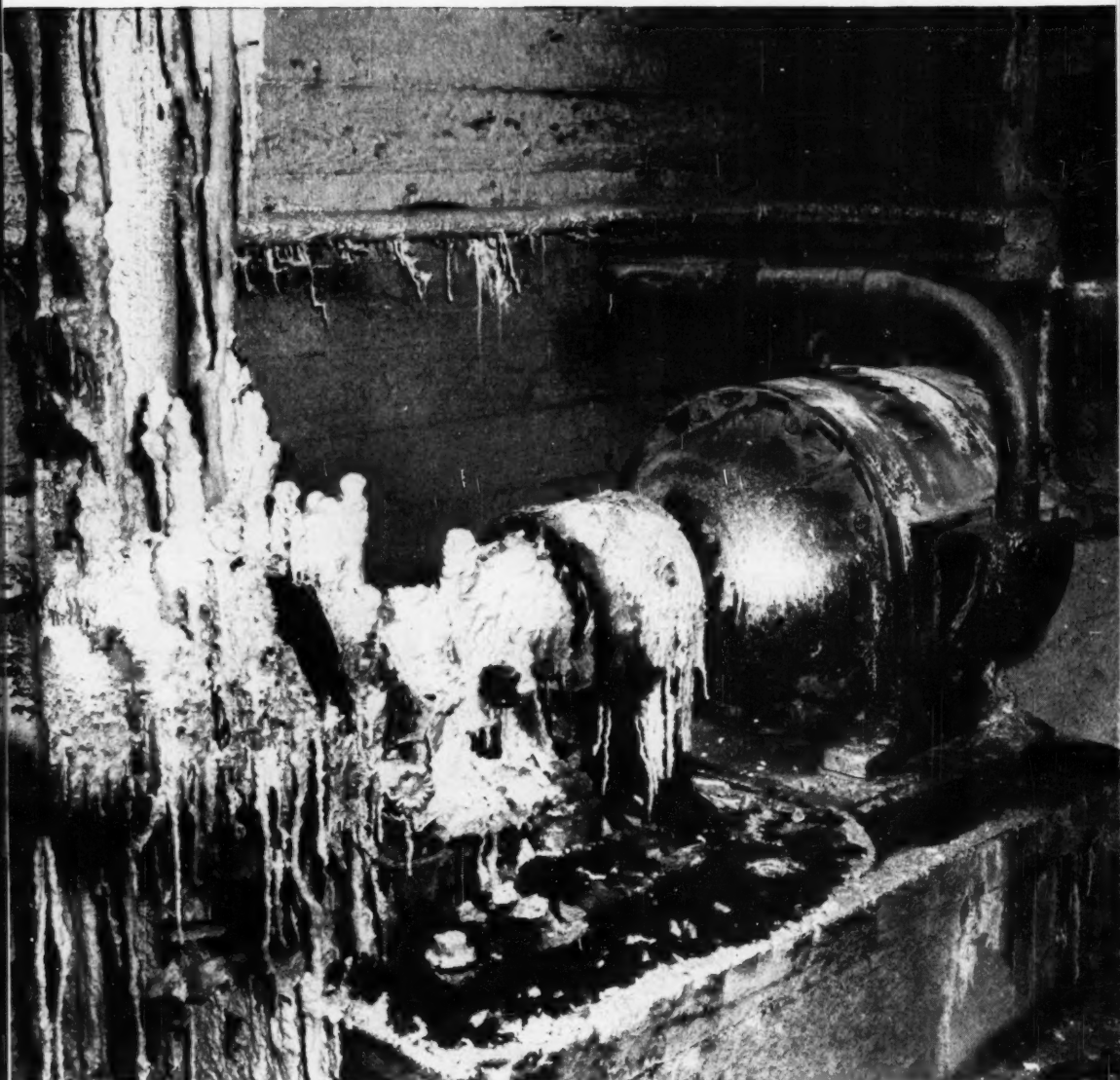
Here's a complete variable speed power plant in one, space-saving unit . . . incorporating an operating principle proved in 300,000 installations . . . ruggedly constructed for years of trouble-free service. Without stopping the machine, a turn of the REEVES handwheel or touch of a button provides the correct speed for every operation . . . enables the machine to do *more* work and *better* work at lower cost. Available in vertical and horizontal designs; capacities to 25 hp; and speed ratios as great as 10 to 1. For the machines you are now operating and the new ones you plan to buy, obtain all the benefits of stepless speed adjustability by specifying modern REEVES Vari-Speed Motodrive. Send for free catalog No. CE67b-G.

**REEVES PULLEY COMPANY • COLUMBUS, INDIANA**  
*Recognized leader in the specialized field of variable speed control*

accurate • variable  
**REEVES** *Speed Control*



# WHEN JOBS ARE TOUGH



**CORROSIVE ATMOSPHERE** doesn't bother this fan cooled, it runs 12 hours a day, six days a week, driving a standard, "off-the-shelf" Tri-Clad motor. Totally enclosed, flash cooler pump under tough conditions in a chemical plant.

# GENERAL



# ELECTRIC



# INDUSTRY DEPENDS ON

# G-E *TRI-CLAD* MOTORS

REG. U.S. PAT. OFF.

Here are three typical tough jobs being done safely, economically, and without interruption, by G-E Tri-Clad motors. They help show why more than 10,000,000 horsepower of G-E Tri-Clad motors are serving American industry today.

## WIDEST VARIETY

With the widest selection of standard motors obtainable anywhere, the Tri-Clad motor line offers ratings up to 2000 hp; all types of enclosures; gear motors, brake motors, and adjustable-speed drives—plus many other mechanical and electrical modifications to meet your requirements.

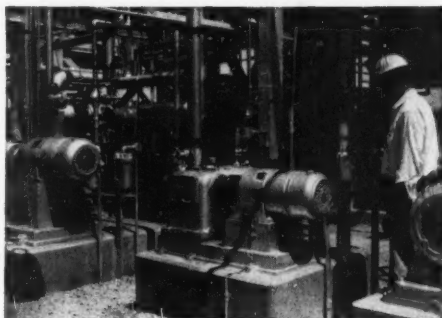
## TRIPLE PROTECTION

You get triple protection with *every* Tri-Clad motor—against physical damage, electrical breakdown, and operating wear and tear. Completely enclosed bearings last longer because they can be relubricated if necessary—and *without shutdown!* For specific product information, use the coupon below, or contact your nearby G-E Apparatus Sales Office, authorized G-E Agent or Distributor.

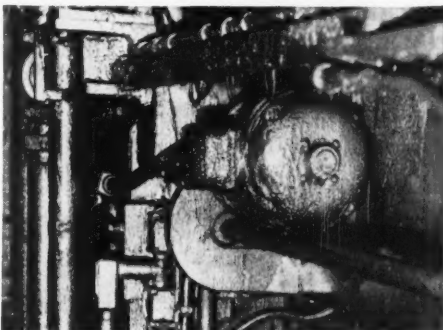
## IMMEDIATE DELIVERY

Most standard G-E Tri-Clad motors are available immediately from stock. And the most complete sales and service network in the motor industry assures you prompt service by trained specialist and application engineers, for all your motor problems. General Electric Co., Schenectady 5, New York.

752-16



**EXPLOSIVE ATMOSPHERE** dangers are avoided by using standard explosion-proof Tri-Clad motors, such as these gear-motors driving water and hydrocarbon pumps in an oil refinery.



**OIL, MOISTURE, ABRASIVE DUST** can't stop this totally-enclosed Tri-Clad motor, operating below the strip in a cold strip steel mill. Motor is completely protected inside and out.

## PROGRESSIVE MECHANIZATION...

a new G-E MORE POWER TO AMERICA program—motion picture and manual—case histories of the latest mechanization trends.



Send for literature.

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General Electric Co., Schenectady 5, N. Y.

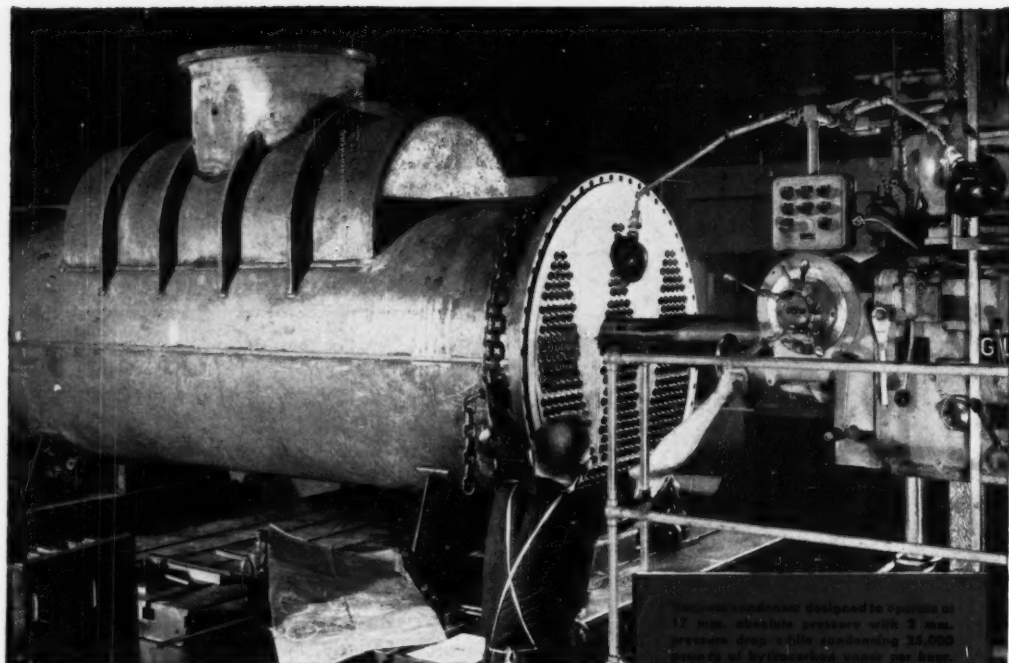
Please send me the following on Progressive Mechanization:

☐ Free copy of the Progressive Mechanization Manual (GEA-5789)

Please send the following product bulletins:

☐ GEA-3580 (Open Dripproof Motors)  
☐ GEA-4400 (Totally Enclosed Motors)

Name \_\_\_\_\_  
 Firm \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



This condenser designed to operate at 17 mm. absolute pressure with 2 mm. pressure drop while condensing 25,000 pounds of hydrocarbon vapor per hour. The installation, shows rolling gasket covers in the tube sheet. You learn with A. O. Smith continuously since 1931.

## SPECIAL Heat Exchangers

### FOR CUSTOMERS' PROCESS REQUIREMENTS

Shown nearing completion is the A. O. Smith solution to one of its customer's heat exchanger problems. Starting with only the process conditions, the condenser was designed and manufactured in its entirety by A. O. Smith.

Successful design of the exchanger to meet critical process require-

ments necessitated a special tube arrangement to provide minimum pressure drop, and inlet nozzles to give maximum distribution of vapors throughout the entire length of the condenser.

For the design and manufacture of special equipment to solve special process conditions, like the

above, A. O. Smith has a corps of experienced research, engineering and manufacturing groups. For over 25 years they have been serving the petroleum and chemical industries, accumulating invaluable experience, data and skills which *YOU* may depend on to help solve *YOUR* heat exchanger and vessel problems.

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Research and Engineering Building

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WITH HEAT EXCHANGER PROBLEMS

# IDEA-PLASTICS

... from Du Pont Polychemicals Department

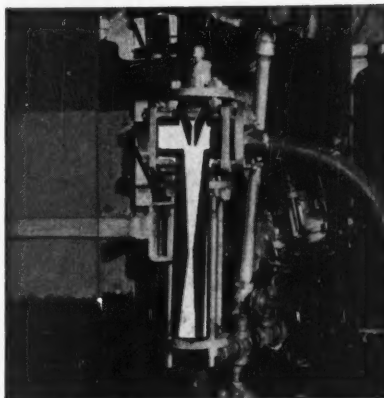
## TEFLON

*jet evactor lasts at least 11 times longer than conventional material*

Sulfuric acid and steam shoot through this jet evactor at 360°F., 150 lbs./sq. in. But, made of DuPont "Teflon" tetrafluoroethylene resin, it's already lasted 11 times longer than evactors previously used. It's saved over \$3500 in replacement parts.

"Teflon" permits a much simpler design in the evactor...eliminates the need for outside support. Wear is negligible...corrosion non-existent. And the excellent mechanical properties of "Teflon" permit easy gasketing at discharge point — where former jets failed most frequently.

"Teflon" is widely used today in gaskets, pump and valve packings. Its unique electrical properties also make it outstanding for many kinds of insulation. And this heavy-duty plastic shows promise for a number of untried applications.



Your business may find opportunities for profitable future use in "Teflon" or in many of the other Polychemicals products. There are more than 100 of them—plastics, organic acids, amides, alcohols, ammonia, esters, resins and solvents.

**Write for technical booklet on Polychemicals products for your industry**

Technical bulletins on "Teflon" tetrafluoroethylene resin and the plastics and chemicals used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the name of your industry.

**E. I. du Pont de Nemours & Co. (Inc.)**  
**Polychemicals Department, 1511E Nemours Building**  
**Wilmington 98, Delaware**



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**VERSATILE\***

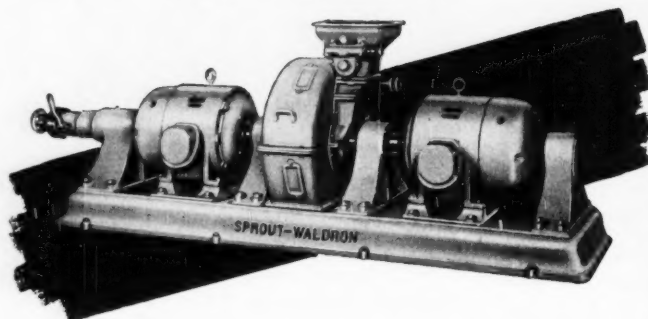
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**\*for RUBBING**

**\*for CUTTING**

**\*for CRUSHING**

**\*for TEARING**



By altering disc surfaces, speed of rotation, clearance between surfaces and method of feeding, the Sprout-Waldron Attrition Mill performs the widest variety of size reduction operations. It grinds rubber or grain, tears and rubs wood chips, curls feathers, de-fiberizes leather, granulates plastics — just to mention a few of its countless applications.

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MUNCY, PA.

**SPROUT-WALDRON**

*The Best in* PROCESSING EQUIPMENT *Since 1866*

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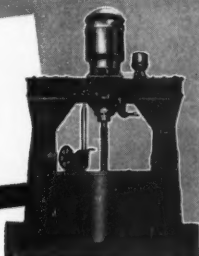
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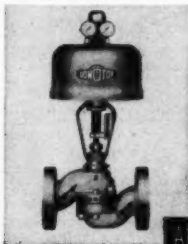


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**Designed for maximum interchangeability of valve bodies, flanges and operators**



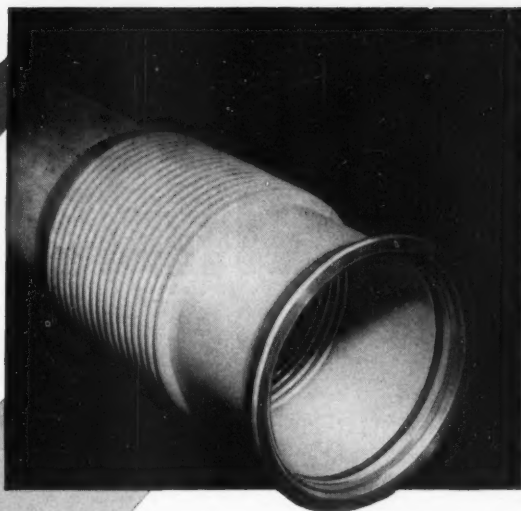
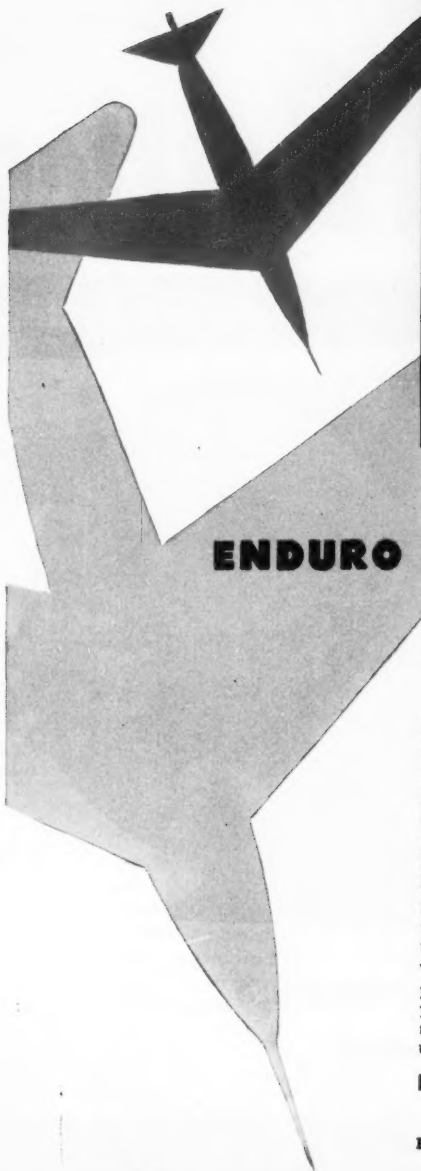
▲ The Annin Domotor valves provide positive control of corrosive, erosive fluids and fluids containing semi-solids.



Because all Annin valve bodies carry 1000# ratings, interchangeable flanges in Series 15, 30 and 60 can be mounted with split-rings on any Annin valve body to meet the requirements of practically any installation. One body, mounted with proper flanges, can be used anywhere in the plant. In addition, any Annin operator—Domotor, Electro-Pneumatic, Handwheel—fits *two* sizes of any valve body. Thus it is unnecessary to stock spares for *every* valve type and size you use. Most Annin users report great reductions in necessary valve stocks from 50% to 75% and more!

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*breathe 600° air*

Ice-melting air surging through aircraft de-icer ducts gets as hot as 600-degrees F. Outside temperatures may go plenty below zero. Ducts expand, contract, expand again. But, accordion-like bellows assemblies—made of Republic ENDURO Stainless Steel—literally “breathe,” compensating instantly for dimensional changes.

Here, 600-degree temperatures don't affect ENDURO Stainless Steel. ENDURO resists heat. Resists corrosion. Resists rust. Serves long and faithfully despite continued flexing at high temperature.

Similar ENDURO bellows are fighting heat and corrosion throughout the chemical process industries. Their use for take-up tubes in ammonia lines is a good example.

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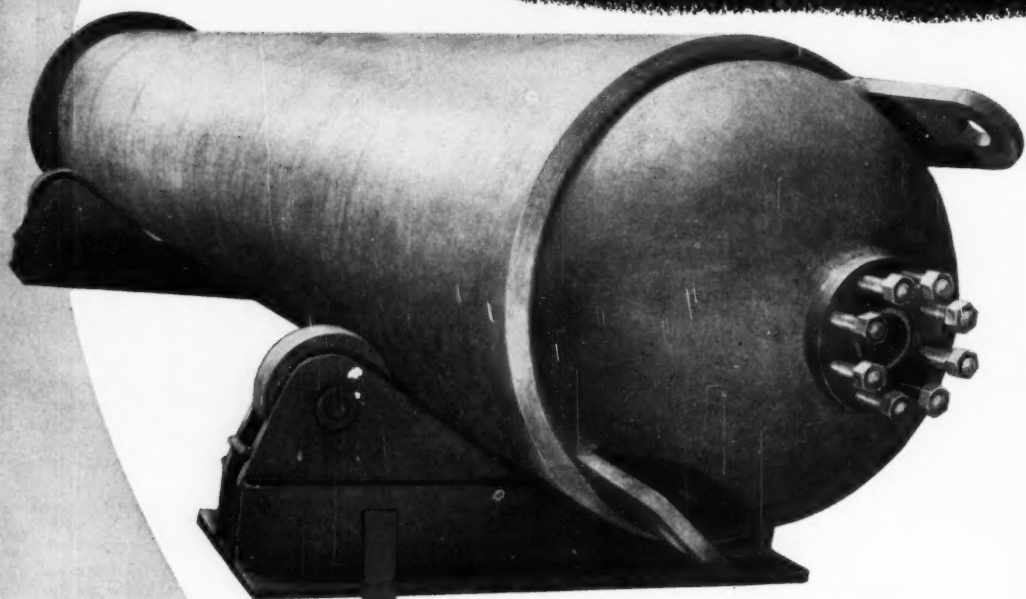
*Republic*  
**ENDURO STAINLESS STEEL**



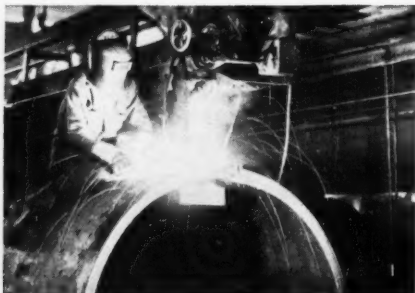
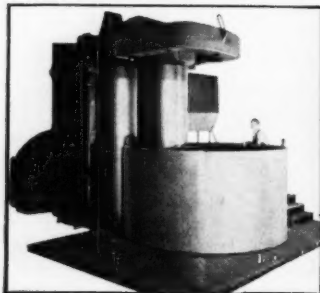
Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Bolts and Nuts, Tin Plate, Tubing, Niles Barrels and Drums

# Banded Bottles

... for Pressure Systems



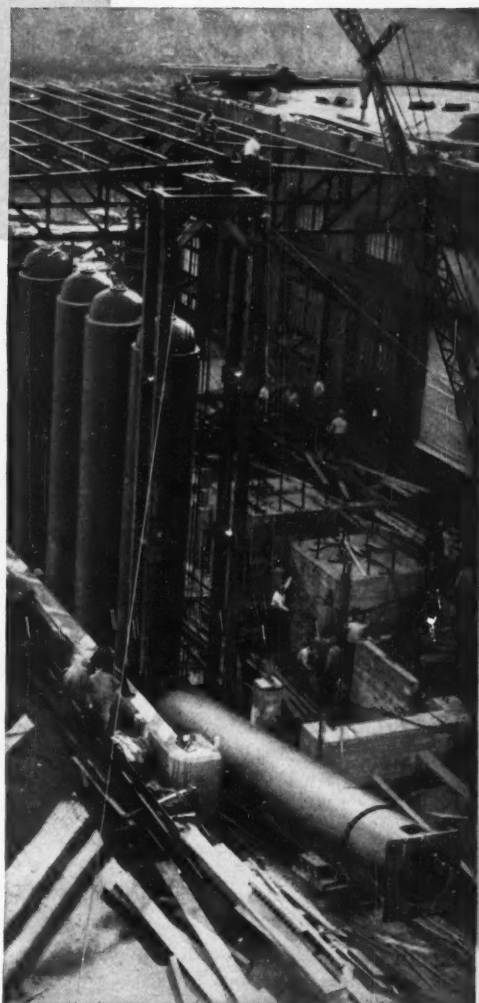
**made-to-measure**  
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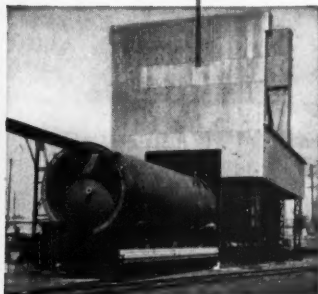
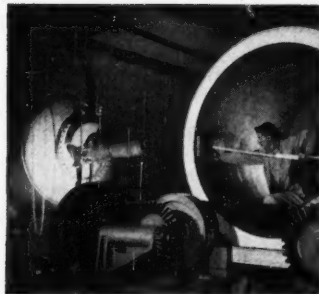
## Up to 6000 psi

For pressures from 2000 to 6000 psi, B&W Banded Pressure Vessels have the advantage of withstanding higher pressures than vessels made by conventional welding construction. The inner vessel, fabricated in accordance with the ASME Code, withstands longitudinal pressure loading. A series of circumferential bands reinforces the inner shell, and enables it to withstand circumferential loading.

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Installation of B&W Accumulators, for use in connection with hydraulic presses.



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& WILCOX**

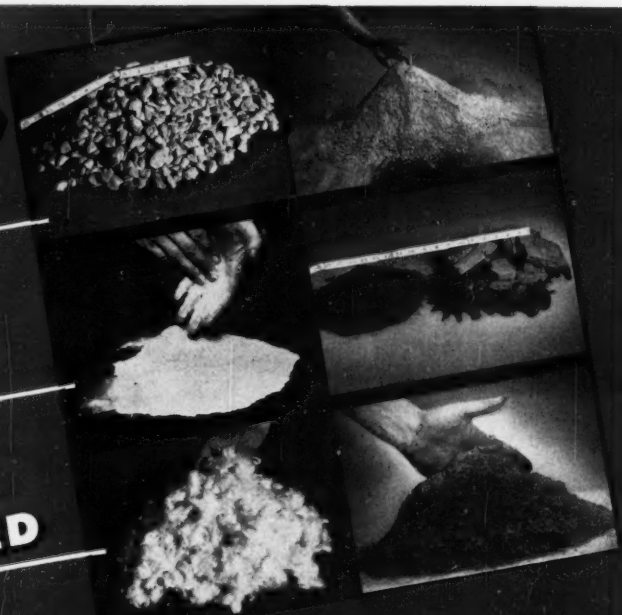
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**CRUSHED**

**GROUND**

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There's a **WILLIAMS** Mill



Whatever the material—mineral, vegetable, animal or chemical—you'll find a Williams Mill to crush, grind, shred or pulp it to exactly meet your most critical specifications. Of equal importance, and regardless of the size of the job, there's a size and type that will probably do it in one operation entirely without the need for additional or secondary equipment!

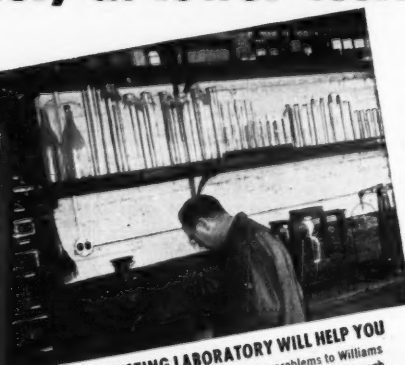
You get more for your investment too, when you choose a Williams! You'll find it more carefully designed, more ruggedly built, for year-after-year service. You'll find it offers the most in low-cost operation, in minimum maintenance, and in features that mean continuously stepped-up production. It will pay you to get *ALL* the facts!

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**to do the job...better,  
faster, at lower cost!**

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HEAVY DUTY HAMMER MILLS, all sizes... ROLLER and IMPACT MILLS with Air Separation for grinding to 325 mesh or finer... HELIX-SEAL MILLS for fine dustless grinding and non-clog wet grinding... DRYER MILLS... AIR SEPARATORS... VIBRATING SCREENS... COMPLETE "Packaged" PLANTS, ready to install in existing buildings.



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Submit your grinding, crushing or shredding problems to Williams for solution—with neither obligation or cost. Simply send enough raw material for a test, and describe the result you want.

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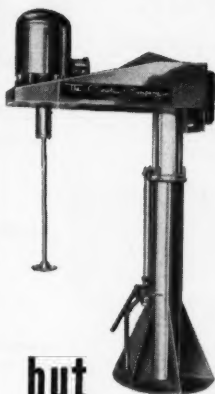
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**OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD**



same  
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CAPACITY  
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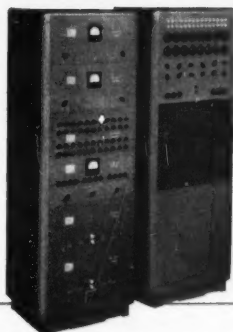
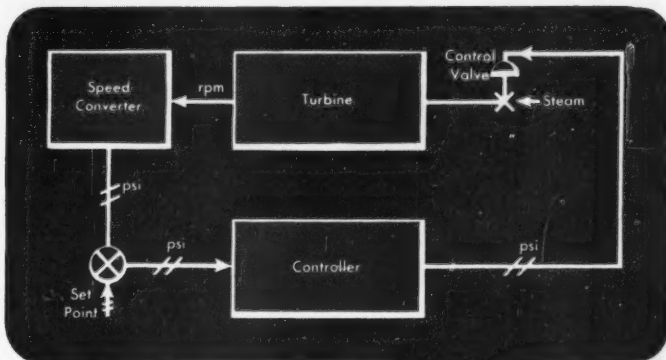
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**THE COWLES DISSOLVER** is a high-speed unit. Its impeller operates at velocities up to 7,500 f.p.m. And that means dissolving and dispersing move 2 to 20 times faster — that you save time and labor while improving your product. It's rugged, fast-loading, easily maintained — performs tasks other mixers cannot because it's engineered to the job.

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INCORPORATED  
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Here's how the **BECKMAN EASE\* COMPUTER** helped solve process design problems at Shell



A Beckman EASE Computer solved in hours instead of weeks, a problem in turbine speed controller design for Shell Development, Emeryville, California. The answers were obtained without making physical alterations in the control system, or endangering installed equipment or products in process.

**ANOTHER OF A SERIES**—The above diagram illustrates the turbine control loop that the Beckman EASE simulated on the Shell application... another in a series of examples illustrating the versatility and adaptability of the EASE to a wide range of industrial applications.

The Beckman EASE Computer very nearly duplicates the values used in the actual field installation. This is significant—that optimum controller settings can be determined in the laboratory. However, of more value is the ability to determine and visually observe the degree of improvement in system performance that can be realized by altering certain component factors fed into the EASE Computer.

The EASE is applicable to the solution of any problem in equipment design or process operation. Costly trial-and-error methods on operating processes are eliminated... optimum settings on automatic control operations are quickly determined... higher production efficiencies, better output at lower costs are all quickly achieved with the Beckman EASE Computer!

Complete details on this Shell problem, are included in Data File mentioned at right.

**THE BECKMAN EASE COMPUTER** functions with equal efficiency as a simulator, tester or equation-solver.

► The EASE may be purchased as a complete unit—or as separate components which may be inter-connected to meet a wide range of individual requirements.

► Because of Beckman production facilities and instrumentation "know-how", the EASE is the lowest-priced quality computer on the market—well within the reach of even small-budget operations.

► Interchangeable plug-in boards permit new problems to be set up while the EASE is in use on other work, reducing "down" time to a minimum and greatly increasing work capacity.

Already in extensive use in complicated aircraft, guided missile control and other applications, the Beckman EASE is the ideal solution to a multitude of modern industrial design, development and control problems. Before you invest in any computer, be sure to get complete details on the many advantages of the Beckman EASE!

For more details write for  
Data File 19-14

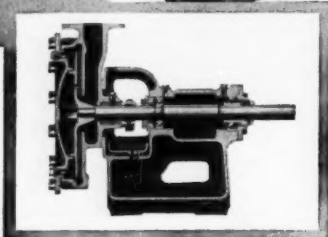
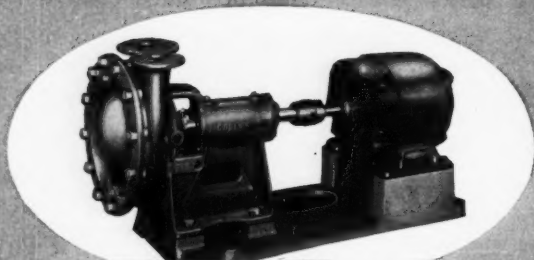
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Beckman instruments include: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments

For economy in handling corrosive liquids...



With the stuffing box on suction side of impeller, pressure on it is limited to the suction head only, assuring long packing life and freedom from excessive leakage. Interior of pump can be inspected and cleaned and impeller can be removed or replaced without disturbing the piping.

## specify GOULDS stainless steel centrifugal PUMPS

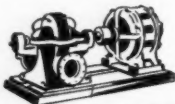
### Other GOULDS PUMPS for processing plants



This highly efficient Goulds single stage centrifugal pump (Fig. 3169) is well suited for general processing purposes. Ten sizes.



Nonclogging impeller of this vertical sump pump (3047) will handle water containing large solids or fibrous materials.



For capacities up to 15,000 G.P.M. Heads up to 500 ft. Check the specifications of this Goulds ball bearing double suction centrifugal (3450).

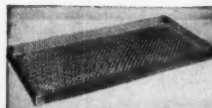
One plant engineer reports better than a seventy-five percent cost saving by handling an especially erosive slurry with Goulds Fig. 3705 Stainless Steel pumps. The pumps previously used not only cost almost four times as much as the Goulds pumps, but the Goulds pumps have already been in service over twice as long.

The entire fluid end of this Goulds Fig. 3705 pump is of stainless steel mounted on a cast iron support. It is regularly carried in stock in No. 316 and FA 20 stainless steels, but other metals and alloys can be supplied for all parts coming in contact with the liquid.

This pump has several features that contribute to economical, 24-hour service with acid and alkaline liquors which quickly corrode standard iron or bronze pumps. Bulletin 725.3 describes this Goulds unit in detail. We will be glad to send you a copy.



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**FREE CATALOG** describes Cambridge facilities for fabricating metal specialties. Write for your copy today.



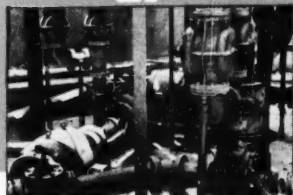
**The Cambridge  
Wire Cloth Co.**

Dept. G. • Cambridge 11, Md.

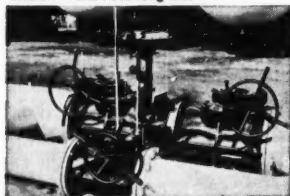
WIRE CLOTH METAL CONVEYOR BELTS SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

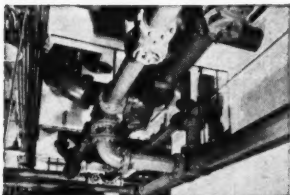
# FULL PIPE SIZE AREA



**IN THE CHEMICAL and INDUSTRIAL PROCESSING FIELD** Q.C.F. Round Port CYLINDRICAL Plug Valves handle abrasive ladings, such as cement slurry, coal wash water, etc., without erosion—and have long life.



**IN PETROLEUM and GAS INSTALLATIONS** Q.C.F. Valves give full-area flow with fast, positive shut-off.



**IN SEWAGE PLANTS** the Q.C.F. CYLINDRICAL Plug shears obstructions on raw sewage lines ... provides uninterrupted flow.

Q.C.f.'s Full Round Port, CYLINDRICAL Plug Valve has a straight level-through flow passage the same size and shape as the pipe itself! This means fast unobstructed flow of heavy or viscous ladings, solids in suspension, all liquids and gases.

And—there is full straight-through pipe area in Q.C.f.'s Rectangular Port, CYLINDRICAL Plug Valve, too.

Investigate—you need "full pipe size area" valves for economical processing.



Write for Catalog 4CE, American Car and Foundry Co., Valve Division, 1501 E. Ferry Ave., Detroit 11, Michigan

Representatives in  
50 Principal Cities

**NEWARK  
Metallic  
FILTER  
CLOTHS**

**Weaves  
that  
STOP  
the Solids!**



Enlargements 4X

Here are five different weaves of Newark Metallic Filter Cloths. All different in the arrangement of the strands; hence different also in their functioning.

Study the shape of the solids in your solution being filtered. That's just as important as the size, if you want clarity of filtrate. Then write us fully about the solids and we'll be glad to recommend the weave of the cloth that will "stop" them.

Many malleable metals are still available so, if necessary, we can probably supply you with a material that will also withstand highly corrosive conditions. When writing, also give solution characteristics.

All Newark Filter Cloths are woven in our own plant, on our own looms, by our own skilled weavers.

Our entire line of Filter Cloths, Wire Mesh and Space Cloth, Sieves, "End-Shak" Testing Units and other Newark Products are described fully in our new Catalog D. Send for a copy.

**NEWARK  
for ACCURACY**

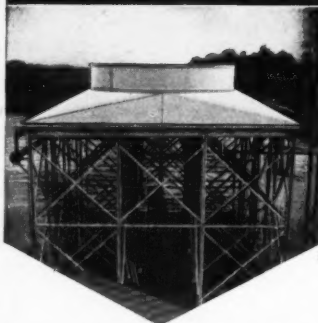
**Newark Wire Cloth  
COMPANY**

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- Aeroloid blade coating unaffected by mild acids and alkalis
- Blade pitch easily adjustable to meet changing power requirements
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- Sales engineers available in principal cities

Koppers Aeromaster Fans are available for any sizable industrial cooling requirement, from diesel locomotives to air-conditioning systems. Standard models, 5 to 24 ft. dia., with 4, 6 or 8 blades per fan. Capacities up to 750,000 c.f.m. Every fan fully guaranteed.

**KOPPERS COMPANY, INC.**



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Gentlemen: Please send me detailed  
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Title .....

Company .....

City ..... Zone ..... State .....

**hot liquids**

**corrosives**

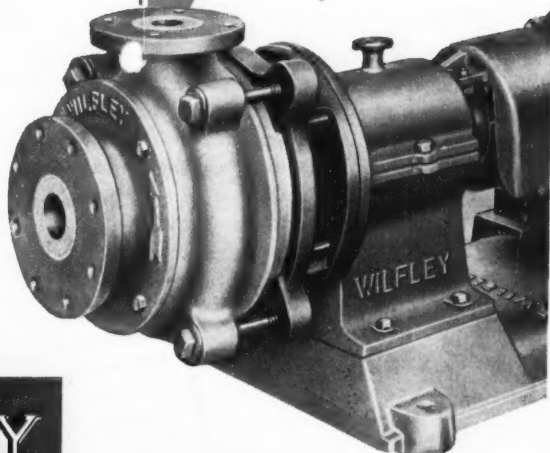
*Buy WILFLEY for cost saving performance*

*Companion to the famous WILFLEY Sand Pump*

**acids**

- For more efficient performance...greater economy of operation...specify WILFLEY "AF" Acid Pumps. Dependable, trouble-free operation, on a round-the-clock schedule, with consequent stepped-up production and worthwhile power savings, are big reasons why modern chemical and processing plants all over the world now rely on WILFLEY Acid Pumps for handling acids, corrosives, hot liquids and mild abrasives.

- Available in 10- to 2,000-G.P.M. capacities, 15- to 150-ft. heads and higher. Wetted parts of practically all machineable alloys. Plastic lined models available. Every application individually engineered. Write or wire for details.



**WILFLEY**  
*Acid* **PUMPS**

**A. R. WILFLEY & SONS, Inc.,** Denver, Colorado, U.S.A.  
New York Office: 1775 Broadway • New York City



**Stuffing Box Under Suction Pressure Only...**



**Makes the  
MORRIS  
Type "R"**

**the Most Trouble Free  
Slurry Pump**

This is the pump with the deep stuffing box under suction pressure only. Entrance of grit into stuffing box is minimized — slurry dilution from stuffing box leakage negligible. The pump requires only nominal sealing water pressure, yet can operate under high vacuum as well as high suction heads. Because of this design, stuffing box troubles are practically eliminated.

The Morris Type "R" — built for handling refuse, sludge, tailings, concentrates, coal, ore and other mineral slurries — can be used to advantage in both non-metallic and metallic mines and mills. For long term efficiency and economy — and a minimum of maintenance and shutdowns — specify Morris Type "R" Slurry Pump.

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MACHINE WORKS**

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**FREE TECHNICAL  
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For further information  
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#181.

**MORRIS** *Centrifugal Pumps*

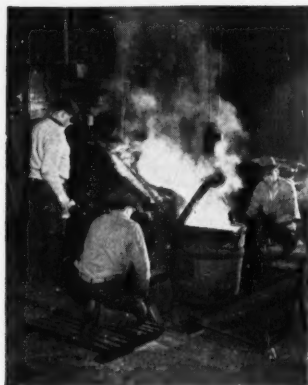
**LEBANON**



**Castings**

*in Stainless  
and Special Alloys...*

**require Control  
in Melting**



Are or induction melting at Lebanon Steel Foundry is an exacting process, for a heat must duplicate *precisely* the material composition required. Electric melting is but one of many production procedures rigidly followed by Lebanon craftsmen that result in CIRCLE L castings of controlled high quality.

**LEBANON STEEL FOUNDRY**

Lebanon, Pennsylvania

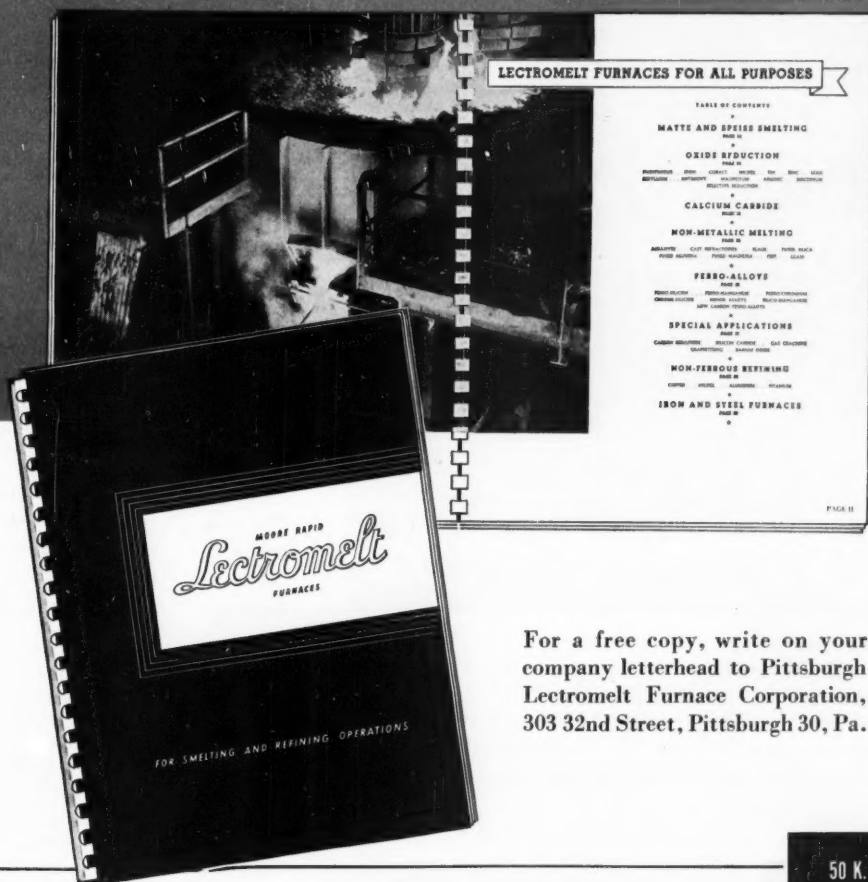
"In the Lebanon Valley"



**LEBANON**  
*Steel and  
Alloy Steel*

**Castings**

**if** you're interested in doing any of  
these things with an Electric Furnace,  
*you need this new book*



For a free copy, write on your company letterhead to Pittsburgh Lectromelt Furnace Corporation, 303 32nd Street, Pittsburgh 30, Pa.

REG. U. S. PAT. OFF.

WHEN YOU MELT... **MOORE RAPID**  
*Lectromelt*



# PRODUCTION COST CUT 35% UPKEEP CUT 50% WITH



**STERLING SLO-SPEED**

## STERLING SLO-SPEED!

*A few years ago we installed Sterling Slo-Speed and Kloss Electric Power Drives throughout our new soap detergent and insecticide plant and they have been doing a fine job in increasing production and reducing costs. Maintenance costs have been reduced 50%... production costs have been reduced 35%... and we have increased production capacity 300%, reports W. S. Jessop, President, U. S. Sanitary Specialties Corp., Chicago.*

### STERLING SLO-SPEED GIVES YOU THE ONE BEST LOW SPEED AND

gives uninterrupted service—carries heavy overhung loads—provides versatile mounting and flexibility in arrangement of machinery—saves valuable space—provides greater safety—costs less to install and use. An indispensable source of low speed power for:

<b>Agitators</b>	<b>Dryers</b>	<b>Presses</b>
<b>Blenders</b>	<b>Feeders</b>	<b>Pumps</b>
<b>Blowers</b>	<b>Kilns</b>	<b>Screens</b>
<b>Conveyors</b>	<b>Mills</b>	<b>Tumblers</b>
<b>Cookers</b>	<b>Mixers</b>	<b>Etc., etc.</b>

#### OTHER STERLING ELECTRIC POWER DRIVES:

- STERLING SPEED-TROL (VARIABLE SPEED) MOTORS
  - STERLING KLOSS AND KLOSS-TITE (NORMAL SPEED) MOTORS
- DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

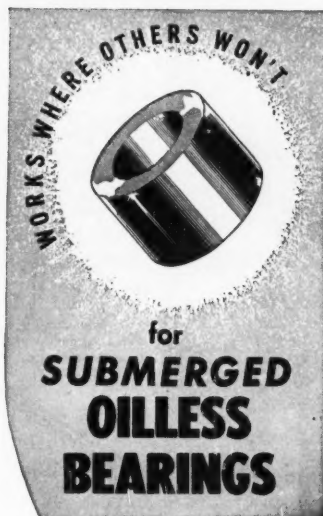


**70 ILLUSTRATIONS** showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. C-119

# STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile.

Offices and distributors in all principal cities.



- OPERATE DRY or SUBMERGED IN DYES, PLATING, CLEANING & CHEMICAL SOLUTIONS, GASOLINE, FOODSTUFFS
- TRULY OILLESS AND SELF-LUBRICATING
- EXTREMELY DURABLE
- CONSTANT COEFFICIENT OF FRICTION
- APPLICABLE OVER A WIDE TEMPERATURE RANGE—even where oil solidifies or carbonizes
- EXTENSIVELY USED IN CONVEYORS, PUMPS & OVENS
- ROTATING SEALS OF GRAPHALLOY ARE UNEXCELLED

## GRAPHITE METALLIZING CORPORATION

1024 NEPPERHAN AVENUE, YONKERS 3, NEW YORK



### AGAIN WE STRESS THE TERM "TAILOR-MADE"...

Because — NFM fabrics coupled with our cutting and sewing techniques result in made-up covers of low cost and high quality

### HOW CAN NFM FIT INTO YOUR PICTURE?

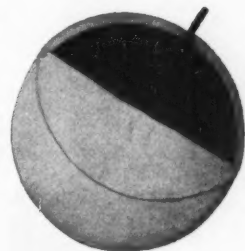
By relieving you of the need of maintaining inventories of roll cloth, of sewing threads

By offering you experienced labor at rates based on volume production of element covers for all types of equipment in liquid and pneumatic filtration fields

By our two factories — New Haven and Salt Lake City — located to give you maximum service and minimum delay in shipment

### WHAT CAN YOU DO?

Order a trial quantity of made-up covers for your equipment. Compare our workmanship and price with your own figures. We feel sure you'll become another customer for our "Tailor-Made" products



Weavers of Industrial Filter Media for over Forty Years

## The National Filter Media Corp.

General Offices & Mills: New Haven 14, Conn.  
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Sales Offices—Representatives

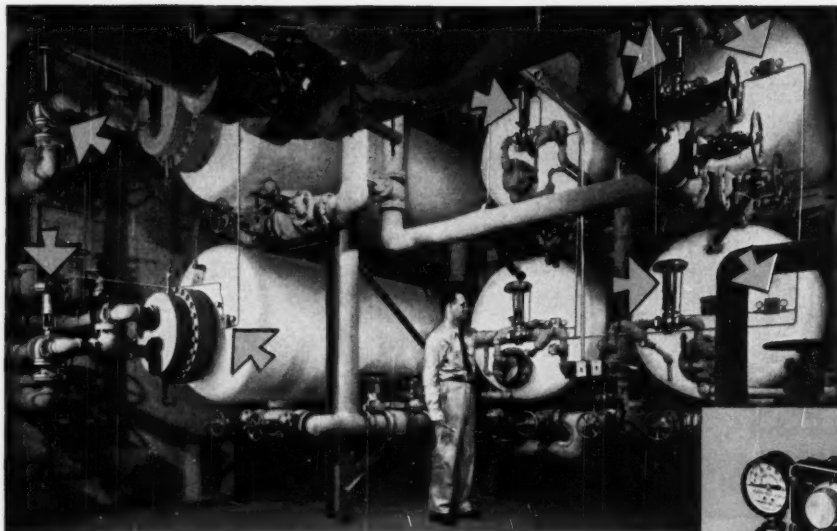
Chicago, Ill.  
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Boscawen Center Bldg.

Houston, Texas  
1406 Second National Bank Bldg.

Oslo, Norway  
Nicolai Friis

Johannesburg, South Africa  
Edward L. Salomon



Chief Engineer Edward MacDonald states "Performance of Powers Accritem Temperature Regulators has been highly satisfactory on the 6 water heaters shown above as well as on booster heater for dishwasher and for controlling cooling of condensate before discharge to sewer."

## WATER HEATERS AT LEVER HOUSE New York City

Architects: Skidmore,

Owings & Merrill

Consulting Engineers:

Jaros, Baum & Bolles

Contractor: Gillman-

Rous-Pesce Corp.



One of  
Lever Brothers Co.  
Famous Soaps



Powers ACCRITEM Regulator  
Compressed Air or Water Operated

Unsurpassed for reliability and power to operate large or small diaphragm valves controlling Water Heaters, Heat Exchangers, Jacket Water Cooling for Diesel Engines or Air Compressors and many Industrial Processes.

# POWERS WATER TEMPERATURE CONTROL

**ACCRITEM Regulators** were selected for LEVER BROTHERS beautiful modern building on Park Avenue in New York City. The air conditioning system here is also Powers controlled.

Water heaters in more and more prominent buildings are being equipped with Powers Accritem Regulators because of their —

## Important Features that Give Better Control and Lower Maintenance

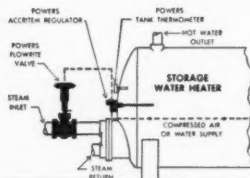
- **Adjustable Sensitivity** and over-heat protection.
- **Calibrated Dial** temperature adjustment.
- **Simple, Rugged Construction** withstands vibration and insures years of reliable service.
- **Temperature Ranges** 50-250° F. and 150-350° F.
- **Easy to Install.** Requires 15 lb. supply of compressed air or water for its operation.
- **Small Size**—regulator head is only 2 7/8" x 3 5/8", sensitive bulb is 12" long with 1/2" I. P. S. connection.

Bulletin 316 gives full details

Call Powers for aid with your problems of temperature control. Our more than 60 years of experience may be helpful to you. Whether you want a simple self-operated regulator or thermostatic water mixing valve or a pneumatic control system with recording controllers...contact Powers.



POWERS  
3-Way  
FLOWRITE  
Water Mixing  
VALVE  
Used on two  
heaters above



POWERS  
Single Seat  
FLOWRITE  
VALVE  
Used on  
4 heaters  
above

## THE POWERS REGULATOR COMPANY

Skokie, Ill. • Offices in Over 50 Cities, See your phone book • Established 1891

(a91)



**FILTRATION**  
**Aeration**  
**AGITATION**  
**Diffusion**  
**ELECTROLYSIS**  
**GAS**  
**ABSORPTION**  
**CATALYST CARRIERS**

## What's your problem?

Many of America's leading chemical industries have found the answers to problems in these processes in products by

# FILTROS



The complete line of FILTROS porous, acid proof, silica and chemical porcelain products includes:

- Flat and Curved plates
- Cylinders & Rods
- Built-up cells
- Grooved bottom plates

Discs  
 FilTROS "35" Electrolytic Diaphragms  
 FILTROS is supplied in a wide range of permeability and is air tested to assure absolute uniformity. Much of FILTROS annual sales volume consists of highly specialized porous ceramic products made to individual specifications in cooperation with customers chemists and engineers. A number of chemical, electrolytic, and catalytic processing problems have been solved in this way by FILTROS where nothing else could accomplish satisfactory results.

### Many of America's "BLUE CHIP" Industries Are FILTROS Users

FILTROS products are currently in use by these outstanding companies:

- American Cyanamid
- Buffalo Electro Chemical
- Carbide & Carbon Chemicals
- Cincinnati Chemical
- Dow Chemical
- DuPont
- Eastman Kodak
- Kennedy Van Saun Mfg. & Engr.
- Monsanto Chemical
- Penna. Salt Mfg.
- Reilly Tar & Chemical
- Riverside Portland Cement
- Rohm & Haas

FILTROS engineers will gladly cooperate with you on any special problems. Write for detailed information and tell us how we may help.



**FILTROS, INC.**

567 West Commercial St., East Rochester, N. Y.

**Pioneer Manufacturers of Porous Ceramics — Since 1913**

# YOUR DIFFICULT SEPARATIONS solved

## CLASSIFICATION

Small particles recovered in the overflow with no stray coarse particles.

Oversize particles separated into the underflow.

## SOLUBLE RECOVERY

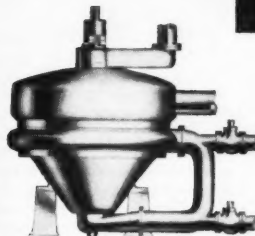
Mother liquor separated from solids with minimum loss or dilution.

Rejected solids stripped of valuable solubles by Merco's counterflow wash.

## CONCENTRATION & WASHING

Suspended solids concentrated and washed free of contaminating solubles.

Rejected liquor carrying the solubles from the original feed.



The Merco Centrifugal Separator is a fast economical means to achieve separations that are tedious or impossible by other methods. Here are typical examples: **classifications** at particle sizes as small as 1 micron; **soluble recoveries** as high as 99.9% in one stage (with immiscible wash); and **concentration** of solids to as high as 65% dry substance. Fully continuous operation and high efficiency in these and other separations result from Merco's unique **Return Flow**.



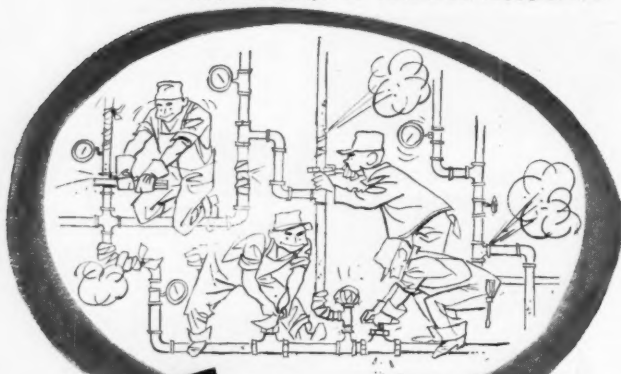
Feasibility and economics of the Merco for your particular separation problem can be determined by laboratory tests and pilot plant evaluations. Inquiries receive prompt attention.

Write today for bulletin C-27 and application data.

## MERCO CENTRIFUGAL CO.

AFFILIATE OF THE MERRILL COMPANY, ENGINEERS  
 150 GREEN STREET • SAN FRANCISCO • CALIFORNIA

*Cross out those nightmares  
about special tools and  
intricate installations*



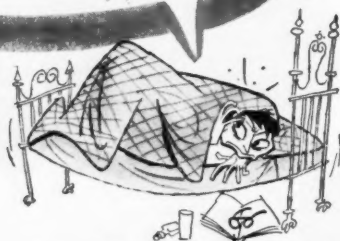
**install  
corrosion  
resistant**



#### RELATED PRODUCTS

Saran rubber tank lining. An outstanding lining which resists grease, many solvents, acids and other chemicals.

Saran rubber molded parts. Stoppers, diaphragms, various-sized moldings for valves, instruments, etc.



Because saran lined steel pipe can be cut and threaded in the field without the need for special tools or handling, costly down-time can be reduced to a minimum. Moreover, the dependable, long-term service and excellent corrosion resistance of saran lined steel pipe keep maintenance costs low. Rigidity and pressure strength are additional advantages. Wherever piping with unusual resistance to most chemicals and solvents is indicated, install saran lined steel pipe. Reduce shut-down time and costly equipment replacement. *Saran lined steel pipe is manufactured by The Dow Chemical Company.*

Write to the Distributor:

### Saran Lined Pipe Company

2415 BURDETTE AVENUE • FERRDALE, MICHIGAN  
Offices in: New York • Boston • Pittsburgh • Tulsa  
Philadelphia • Chicago • Portland • Indianapolis • San  
Francisco • Houston • Denver • Los Angeles • Seattle  
Cleveland • Charleston, S. C. • Toronto • Montreal

Saran Lined Pipe Company,  
2415 Burdette Avenue, Ferndale, Michigan  
Please send me a copy of your catalog on  
Saran Lined Pipe, Valves and Fittings.

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

SP-502B-1



## THERE'S A MONARCH NOZZLE FOR EVERY SPRAY JOB

Remember—if the liquid can  
be sprayed with direct pres-  
sure Monarch can furnish  
the Nozzles

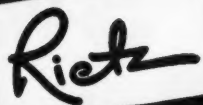


*In many industries  
Monarch Spray  
Nozzles are used for:*

**ACID CHAMBERS  
AIR WASHING  
CHEMICAL  
PROCESSING  
COOLING PONDS  
DESUPERHEATING  
GAS SCRUBBING  
HUMIDIFYING  
OIL BURNERS  
SPRAY DRYING**

Catalogs 6 A and 6 C  
Sent on Request

**Monarch Mfg. Wks., Inc.**  
2513 E. ONTARIO STREET  
PHILADELPHIA 34, PA.



**specializes  
IN SIZE  
REDUCTION**



### **Disintegrators**

For fine or coarse grinding, pulverizing, pulping. 360° screen in wide variety of sizes. Patented differential discharge.



### **Prebreakers**

for preliminary size reduction operations requiring crushing and breaking of tough materials. **Rietz BLOCKBUSTERS** are used for frozen meat blocks.



### **Thermascrows**

**TL COOKERS:** continuous screw-conveyor steam blanchers. **TJ HEAT EXCHANGERS** for heating or cooling; batch or continuous.

Equipment for the  
food and chemical  
process industries



**MANUFACTURING CO.**

Santa Rosa, California

## **Niagara's HYGROL DRIES AIR BEST with exact moisture content**

- ▶ to control your product's quality
- ▶ to prevent condensation on your product or material
- ▶ to prevent changes due to moist air in contact with your product
- ▶ to protect your material from dampness
- ▶ to protect your processing of moisture-sensitive material
- ▶ to DRY your material or product
- ▶ to pack or store your product safe from moisture damage
- ▶ to get exact moisture control for the precise atmosphere condition you need
- ▶ to provide precise atmospheric conditions for testing
- ▶ to increase your air conditioning capacity
- ▶ to DRY large quantities of fresh air from outdoors

### **The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is**

**Best and most effective because . . .** it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

**Most reliable because . . .** the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

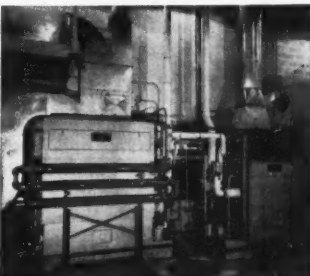
**Most flexible because . . .** you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

**Easiest to take care of because . . .** the apparatus is simple, parts are accessible, controls are trustworthy.

**Most compact, taking less space for installation.**

**Inexpensive to operate because . . .** no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

**The cleanest because . . .** no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.



### **Niagara Controlled Humidity Air Conditioning**

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

*For complete information write*

## **NIAGARA BLOWER COMPANY**

Dept. CE, 405 Lexington Ave., New York 17, N. Y.

*District Engineers in Principal Cities of United States and Canada*

# 5-way Protection

— protection against  
volatile vapors . . .  
chemical fumes, corrosive  
liquids . . . high  
humidity . . . salt air

## Louis Allis Chemical Motors

A Louis Allis Chemical Motor protects you these five ways against corrosion:

1. **Cast-iron construction.** Stator housing, end brackets, and conduit box are cast iron, well-known for its resistance to corrosion.
2. **Cartridge-type ball bearings.** Motor can be completely disassembled without exposing bearings or lubricating grease to dust.
3. **Stainless-steel shell over housing.** Non-corrosive shell directs air over housing to cool motor. Shell is easily removed, to clean air passages.
4. **Removable bearing caps.** Let you examine bearings without dismantling motor.
5. **Cast-bronze ventilating fan.** Keeps motor temperature down, and is non-corrosive.

Additional features available include: Special Class A or Class B chemical insulation for extreme corrosive conditions or high ambient temperatures; and drain and breather plugs for elimination of internal condensation due to "breathing."

You can get Louis Allis Chemical Motors in NEMA frames 224 through 505 and frame 108 — in standard, enclosed, fan-cooled construction and enclosed, fan-cooled, explosion-proof construction. They carry Underwriters' approval for Class I, Group D or Class II, Group F or G hazardous locations.

Let the Louis Allis engineer help you solve your motor problem and cut your maintenance costs. Call him in soon.

THE LOUIS ALLIS CO., Milwaukee 7, Wisconsin

CM-101

**We specialize in  
SPECIAL MOTORS**

Self-Cleaning  
Textile Motor



Walled Shell Stainless Motor

Gearmotor



Oil-Well  
Pumping Motor

Extractor Motor  
with Integral  
Blower



Single Phase  
Pump Motor with  
Tripod Base

Adjust-Speed  
with Eddy  
Current Brake



Sanitary Motor

Special Arbor Type Motor



Splash-Proof Motor  
with Flange



Blower Ventilated  
Frequency  
Converter



Standard or special — we build it. Whatever electrical or mechanical modifications or features you need, there is a Louis Allis motor that will do your toughest jobs better.



What's  
Your  
need

a Chemical  
Intermediate,  
Solvent,  
Wettant, or  
Plasticizer?

then try

**THFA\***

(Tetrahydrofurfuryl Alcohol)

Write for a sample, and literature describing the properties of THFA. A request on your letterhead to one of our offices will receive prompt attention.

\*Reg. U.S. Pat. Off.

### The Quaker Oats Company



#### CHEMICALS DEPARTMENT

335J, The Merchandise Mart,  
Chicago 54, Illinois

Room 535J, 120 Wall St.,  
New York 5, N. Y.

Room 435J, P. O. Box 4376,  
Portland 8, Oregon

In San Francisco: The Griffin Chemical Company.

In Europe: Quaker Oats-Graanproducten N.V.,  
Rotterdam, The Netherlands; Quaker Oats  
(France) S. A. 42, Rue Pasquier, Paris 8<sup>e</sup>,  
France.

In Australia: Swift & Company, Pty., Ltd.,  
Sydney.

In Japan: F. Kanematsu & Co., Ltd., Tokyo.

CHEMICAL ENGINEERING—November 1952

## ELIMINATE IRON CONTAMINATION



STEARNS Type "KB"  
removing iron from  
titanate

*from powdered materials*

### USE THE IMPROVED STEARNS MAGNETIC SEPARATOR

Fine iron of abrasion in dry ceramic materials can be a very serious matter, and that's exactly what the D. M. Steward Mfg. Co., of Chattanooga, Tenn. found out. Processing critical titanate materials, they found that the presence of iron caused a serious reduction in the electrical properties of the material. But how to get the iron out positively and economically?

The answer was the STEARNS Type "KB" Magnetic Separator, a separator designed specifically for removing fine iron from powdered materials. A compact, rugged unit, the Type "KB" is perfect for batch operations and color work. Unified electrical control assures complete protection against contamination at all times.

#### STEARNS SEPARATOR FOR POWDERED MATERIALS

- Positive, dependable separation
- Low operating costs
- Continuous discharge of non-magnetic product
- Easy to clean
- For batch and small capacity operations
- EXPERIENCE ENGINEERED to meet your requirements

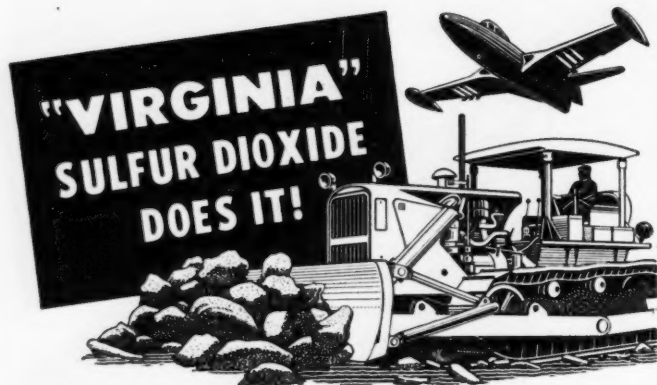


*Foremost in the Magnetic Field*  
**Stearns MAGNETIC INC.**

629 South 28th Street

Milwaukee 46, Wisconsin





## Better fuel for jets and diesels

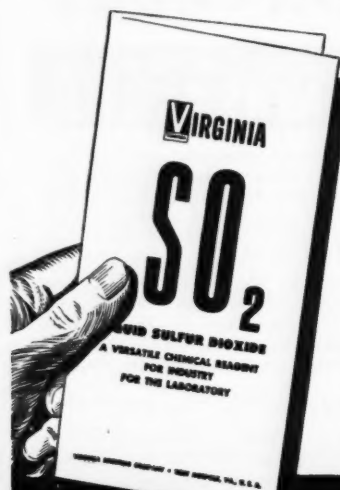
Modern jet and Diesel engines need fuel with a high cetane rating. It's just as hard to produce this high cetane fuel as it is to make high octane gas for conventional engines. The method employed is the Edeleanu Process. "Virginia" Liquid Sulfur Dioxide ( $\text{SO}_2$ ) is widely used in most of the Edeleanu units in the country's big refineries.

High cetane fuel is somewhat similar to kerosene. To make it satisfactory for jet engines, however, it must be highly purified. Extraction under pressure with "Virginia" Liquid  $\text{SO}_2$  removes the impurities from the kerosene fraction.

Here is a typical example of a successful application for  $\text{SO}_2$  in an important segment of the national economy.

It may be that you have use for a superior reducing or bleaching agent, preservative, antichlor, neutralizer or pH control. We'd like to help you to greater efficiency and profit by adapting our versatile  $\text{SO}_2$  to your products or processes. We would welcome a request on your business letterhead for the descriptive "Virginia"  $\text{SO}_2$  booklet.

VIRGINIA SMELTING COMPANY  
Box 21, West Norfolk, Virginia



Field Offices:

NEW YORK

BOSTON

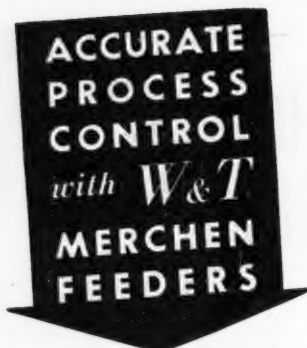
PHILADELPHIA

DETROIT

CHICAGO

ATLANTA

**VIRGINIA**  
Chemicals



W&T Merchen Scale Feeder

Successful process control — particularly in today's modern, high-speed plants — generally depends on the accurate feeding of dry, free-flowing, chemicals. Continuous, precision feeding — by weight — is essential to a uniform end product. And that's what W&T Merchen Scale Feeders can demonstrate in your plant, just as they are doing in hundreds of others.

Merchen Feeders are widely used both for the blending of several dry chemicals and for the addition of one or more dry chemicals to a liquid.

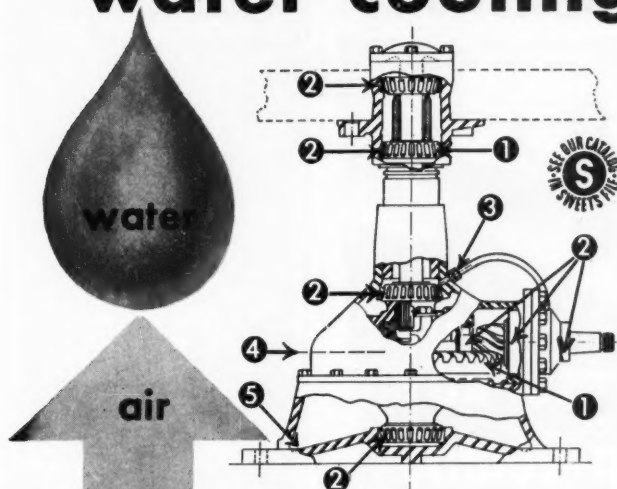
These feeders will handle from a few ounces to several thousand pounds per minute — and, of particular importance in many plants, they can be completely synchronized with other equipment, or equipped for remote or automatic control. For example, Merchen Feeders are equipped to stop automatically and at the same time stop all other synchronized process equipment if the delivery of material for any reason should vary from the rate of feed pre-set on the scale beam.

**SERVICE** — A nationwide service organization is prepared to suggest the proper W&T Merchen Feeders for your process and to give prompt service and installation supervision on Merchen Equipment.

Write today for additional information on W&T Merchen Scale Feeders.



# geared for better water cooling



One of the most vital parts of a water cooling tower is the gear reducer which drives the fan. Smooth, positive power must be transmitted quietly from motor to fan. Water Cooling Equipment Company are the original designers of semi-floating axle gear reducers for water cooling towers, the best type for this use.

Water Cooling Equipment Company gear reducers are the best because:

- ① Not a single pound of weight or thrust of the fan is transmitted to the gears. The entire weight and thrust—up to 1500 pounds—is carried by the lower of the two top bearings of the gear case.
- ② Seven bearings keep the fan shaft and pinion shaft in perfect alignment.
- ③ Positive force-feed oil circulation provides the best lubrication for gears and bearings.
- ④ Large oil capacity assures cooling action on the gears and bearings.
- ⑤ The gear case is shaped so that any sludge formed in the oil is thrown out and down where it cannot recirculate over the gears and bearings.



Semi-floating type WCEC gear reducers transmit more horsepower per pound of gear than any other design. All parts of WCEC gear reducers are standard automotive equipment available in moderate sized cities and towns.

Consider these many important facts when you discuss the purchase of a water cooling tower.

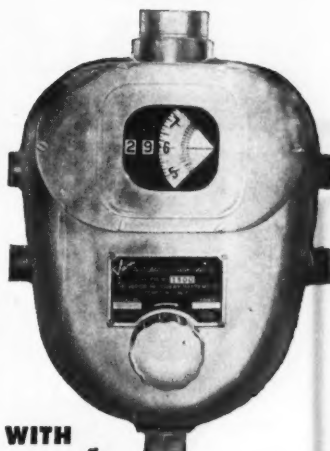
## WATER COOLING EQUIPMENT COMPANY

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CHEMICAL ENGINEERING—November 1952

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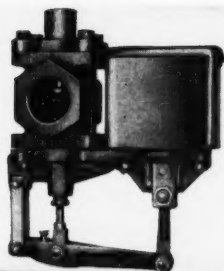
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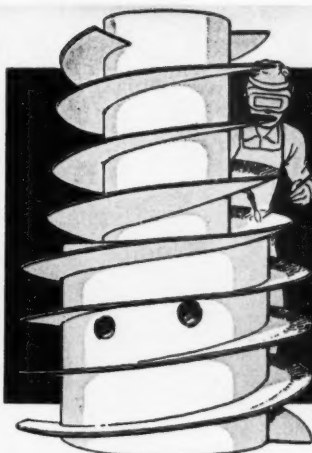
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\*FRUSTROSY is that frustrated condition a man gets into when his problem is Viscosity Determination or Control and he hasn't asked BROOKFIELD.



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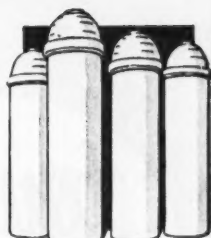
COLMONOY hard-facing alloys protect parts under severe wearing conditions throughout industry... at a cost many times lower than would be incurred by frequent replacements.

SCREW CONVEYOR, shown above, is an excellent example of protecting critical areas to save an entire part. COLMONOY No. 6, an extremely corrosion and abrasion resistant nickel alloy, was used. It is the easiest of all hard-facing rods to apply. Service life of the entire part is greatly extended.

AUTOMATIC VALVE STEMS are typical of an endless number of cylindrical parts that can be hard-faced easily and economically with the COLMONOY Spraywelder. In Spraywelding the alloy is sprayed on and then fused, to form a smooth welded overlay. COLMONOY Nos. 4, 5 and 6 are all available as Sprayweld powders.

PULVERIZER HAMMERS are an example of what COLMONOY No. 1 was designed to do: protect 'rough' parts against abrasion and impact. Applied by arc welding.

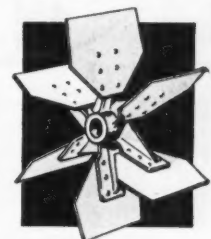
DUST COLLECTOR FAN BLADES are protected from abrasion by COLMONOY Sweat-on Paste. It was applied with a spatula and then fused by carbon arc welding.



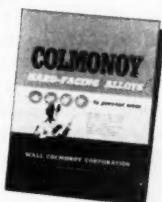
Automatic valve stems



Pulverizer hammers



Dust collector fan



The applications mentioned above are but a few out of the hundreds that have proved the value of Colmonoy alloys in extending equipment service life.

Write for Colmonoy Hard-Facing Manual No. 77; also Engineering Data Sheet No. 3 which shows how Colmonoy alloys protect against the various sources of corrosion.

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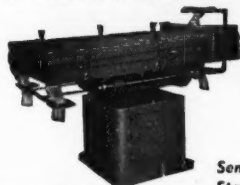
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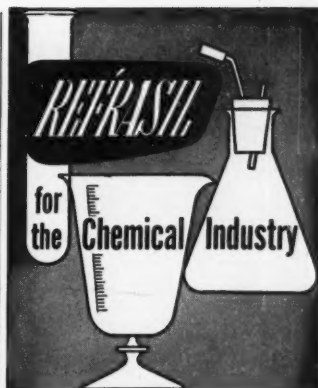


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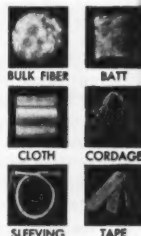
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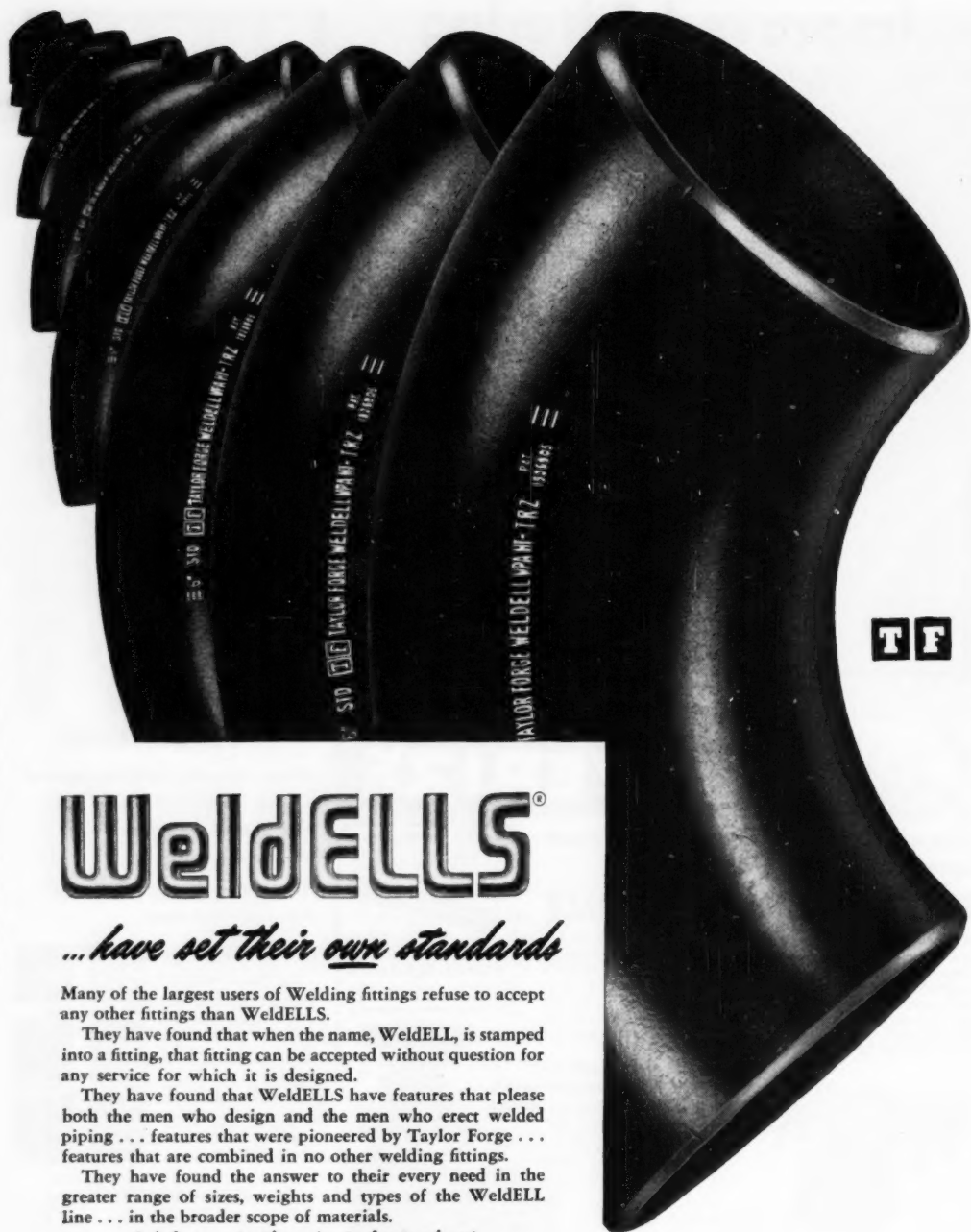


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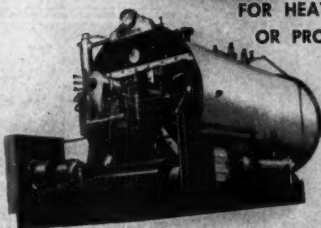
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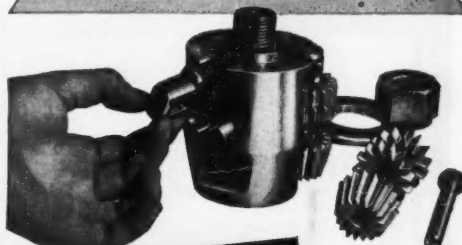
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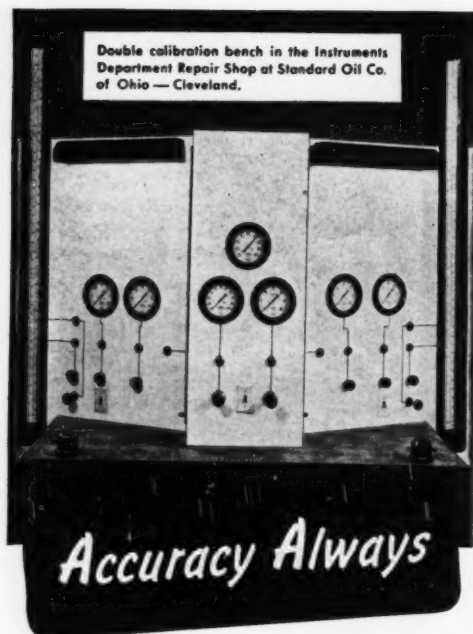
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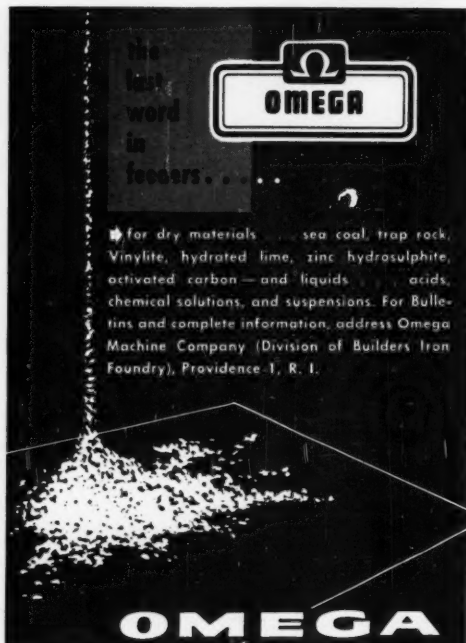


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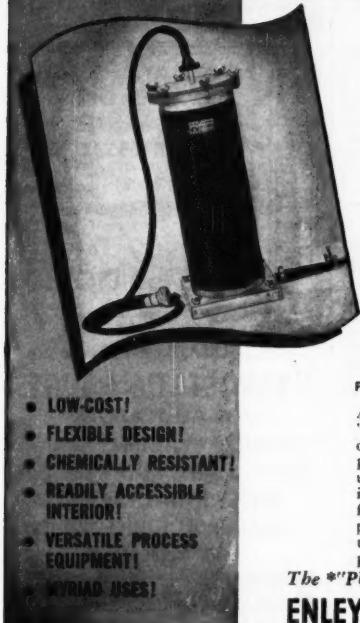
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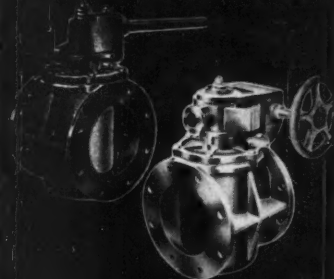
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**in all forms—ranges—stem lengths—connections**

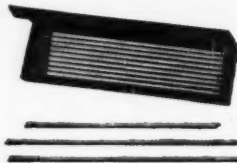
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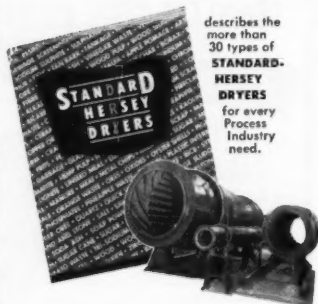
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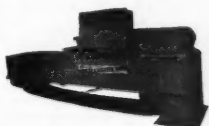
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## GOOD, USED **FMC** EQUIPMENT WILL "PAN OUT" FOR YOU TOO!

The FMC RENTAL-PURCHASE PLAN requires no capital investment; the equipment pays for itself as it produces. Inquire!

Zaremba INCONEL clad Evaporator with INCONEL tubes 430 sq. ft.; 7' x 15½'.  
Goslin Birmingham Steel Sextuple Effect Evaporator.  
Swenson Quadruple Effect Long Tube Film Type Evaporator.  
Zaremba Single Effect Cast Iron Evaporator; 130 sq. ft.  
Swenson Jacketed Crystallizers; 24" x 10' and 24" x 12'; 5 HP.  
MONEL 250 gal. Jacketed and Agitated Reactor with access.  
Stainless Reactors from 24" x 40" to 48" x 60".  
Type 347 Stainless Reactor 18" x 24"; Jktd. and Agtd.  
2,000 gal. Copper Coil Heated Vacuum Pan; 7' x 10'7".  
Stainless (type 347) 16 Section Column; 8½" x 19' high, complete with accessories.  
Copper Bubble Cap Column, having 24 plates; 18" x 12' high.  
STAINLESS Flash Tank, 8' x 6' with stainless tube bundle; print available.  
3,000 gal. Rubber-Lined Vertical Tank, 7' x 10' with rubber-lined valves.  
Croll - Reynolds Vacuum Evaporator in Monel, 30" x 5', with 2 Stage Evaporator.

Pfaudler Glass - Lined Jacketed 400 gal. Reactor.  
Buffalo 20 Shelf Vacuum Dryer; 40" x 42", complete with accessories.  
Stokes 16 Shelf Steam Heated Dryers; 3' x 3', 6'10" overall.  
Horizontal Dryers with tracks; 66' x 147" long, 2½" steam pipe.  
2 Stainless Drum Dryers; 5' x 10' with accessories.  
2 Bird Rubber Covered 48" Centrifugals; 2 speed 40 HP motors.  
Bird Young Rotary Vacuum Filters with S.S. Screens, 4' x 4'.  
International Type X24 Porcelain - Lined Pebble Mills; 8' x 8' motorized.  
Abbe Buhrstone-Lined Mills; 32" x 36", 54" x 60" and 60" x 72".  
Lancaster Model EAG4 Double Muller Mixer; 10 HP, complete.  
Robinson Unique STAINLESS Mixer with Sifter; 17" x 30" x 20"; 2 HP.  
NEW STAINLESS Double Ribbon Mixer; 24" x 96"; 24 cu. ft.  
J. H. Day JUMBO Mixer; 44" x 78" x 52".  
J. H. Day 5 gal. STAINLESS Double Arm Jacketed Mixer; Vac. cover.  
Baker Perkins STAINLESS Sigma Mixer; 6" x 12"; 2 HP XPL motor.  
W. & P. type 100 gal. working Jacketed Double Arm Mixers.

FRED R. FIRSTENBERG, President

## FIRST MACHINERY CORP.

157 HUDSON ST.

Worth 4-5900

NEW YORK 13, N. Y.

## STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED — 3000 gallon capacity. Welded construction — Fully insulated. Equipped with man-head. Suitable for milk, food products, oily white chemicals, solvents and fine lacquers.

VARNISH TANKS—USED—34" diameter x 14' high (or long) ½" Steel — Welded construction — 1700 gallons.

MISCELLANEOUS TANKS—Various sizes and types.

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LURIA STEEL & TRADING CORP.

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HARDINGE MILLS: 7"x48", 8"x22", 10"x48" w/ motors.

PEBBLE MILLS: Lab: 30x33, to 6'x8' w/ motors.

SCREENS—18x48 Double Selectro with motor.

Tyler hummer 3x5 single/double/triple.

HAMMER MILLS: Wms. LG 1. BX 825. Reg. #1-GA30.

CENTRIFUGE: 26", 40", 48" Rubber Covered.

FORK LIFT—4000# Towmotor, Gas.

ROTARY KILNS—4x30, 4x40, 5x40, 6x40, 6x80.

CRUSHERS, JAW—11x14, 11x20, 24x36. PUMP—Viking ZM 4" w/ motor.

FILTER PRESSES—Shriver 24"x28 P&F. Closed. 30" w/ 29 P&F open washing.

30" Shriver w/ 30 P&F closed washing.

LAWLER COMPANY

Durham Avenue Metuchen, N. J.  
Metuchen 6-0245

CLASSIFIERS: —Akins and Wanco 54" and 78", single screw, double pitch, weir type, 220/440 volt motors, all in new condition. Three of the above located near Reno, Nev.

KILNS: 2—Kilns 7'8" x 125' with Fuller Lehigh grate type coolers 3'8" x 18" with or without all auxiliary equipment.

AIR SEPARATORS: One Bradley and one Sturtevant 18 ft., with or without 100 H.P., 440, volt, motor.

PULVERIZERS: Hardings Mill size 5 ft. x 22", steel lined, complete with disc feeder and 30 H.P. motor. 1—3' x 4' Elmco Ball Mill complete with liners, ball charge, V-belt drive and 20 H.P. motor and control. NEW condition. One Marcy Rod Mill 8' x 12" and one 5' x 14", manganese lined, with motors and drive. 1—Allis Chalmers 4' x 8' Rod Mill, peripheral discharge, complete.

CLAM SHELL BUCKET: Hayward 2½ yd. capacity, class E, with or without new spare parts.

LOCOMOTIVE CRANE: American 20 ton, standard R.R. gauge, with 1½ yd. clam shell bucket, gasoline powered.

A. J. O'NEILL

Lansdowne, Pa.

Phila. Phones: MADison 3-8300—3-8301

### ROTARY DRYERS

1—70" x 33" Bugles Coles A-10.

Single Shell: 4x30, 4x45, 5x30, 6x35, 5½x7x60.

### MISCELLANEOUS EQUIPMENT

Hammermills: Jeffrey 36 x 24 B & 48 x 36 Flex-

tooth-Williams 60 GA.

Dings 60"-3 Roll Type L.R. Magnetic Separator.

8' 10" x 10' Mechanical Air Separators.

8' x 6', 6' x 6', 6' x 10' & 7' x 6' Ball Mills.

20' & 31' Raymond Automatic Pulverizer.

4x45, 6x30, 5½x7x60 & 4x30 Rotary Kilns.

2—5' x 22' Silex Lined Tube Mills.

150000 c.f.m. Multistage Dust Collector.

18' x 36" Hardings Air Caudrying Ball Mill.

2—5' x 18 Tube Mills.

Heavy Media Separation Unit.

Hercules Junior 5 Roll Pulverizer.

Clyde-Kuntz Continuous Hydrator.

7 Elec. Air Compressors, 1500, 3100 & 3274 Ft.

135—3000 & 10,000 Gal. Tank Cars.

45 Ton Plymouth Diesel Locomotive.

150 Ft. Chap Fleet. Elec. Compressor.

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- BARS • TUBING
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74 Lockwood St., Newark 5, N. J.

If there is anything you want

or something you don't want that readers can supply—or use—advertise it in the

Searchlight Section

# When You **STOP** To Consider COST - QUALITY - AVAILABILITY YOU JUST CANT BEAT **GELB** for **VALUE.**



THE GELB GIRL—NOVEMBER 1952

- 1—Baker Perkins Stainless Steel Dispersion Mixer, Size 15, Type VUMM, 100 gals. working cap., 150 gals. total cap., 75 HP Drive.
- 1—Baker Perkins Stainless Steel Jacketed Lab. Mixer, Size 4, with 2 HP Explosion Proof Motor, 0.7 gals. cap. Sigma Blades.
- 1—Baker Perkins Steel Mixer, Size 6, 1/11 BS, with Zeta blades.
- 1—Patterson Stainless Steel Autoclave, 225 gals. cap. with stainless steel turbo agitator, 225 PSI internal pressure.
- 1—Glascote glass lined jacketed vac. reactor, 1600 gals. cap. (Unused).
- 1—Combustion Engineer Stainless Steel jacketed autoclave, 500 gal. cap., 300 PSI internal pressure.
- 1—Struthers Wells Hastelloy B Heat Exchanger, 450 sq. ft.
- 2—Shriver 24" x 24" cast iron, closed delivery, filter presses, 3 eye, 23 chambers each.

**DRYERS—KILNS**

- 1—Louisville Rotary Steam Tube Dryer, 6'x30'.
- 1—Ruhk Rotary Steam Tube Dryer, 3'x12'.
- 2—Builovak Vacuum Drum Dryers, 24"x20".
- 2—Builovak stainless steel double drum dryers, 6"x38", vacuum and atmospheric.
- 2—Builovak Double Drum Dryers, 5'x12'.
- 1—Builovak Double Drum Dryer, 32"x30".
- 1—J. P. Devine Vacuum Dryer, 5'x25'.
- 20—J. P. Devine Lab. Vacuum Shelf Dryers, 5 shelves.

**FILTERS**

- 1—Shriver 42"x42" Evudor (Bronze) Plate & Frame Filter Press, 40 Chambers. Closed Delivery.
- 1—Sperry 42"x42" Cast Iron Plate & Frame Filter Press, 18 Chambers. Close Delivery.
- 1—Shriver 36"x36" Cast Iron Plate & Frame Filter Press, Steam Jacketed, 48 Chambers. Closed Delivery.
- 3—Shriver 36"x36" Cast Iron Plate & Frame Filter Presses. Closed Delivery, 24 & 25 Chambers.
- 4—Sperry 12"x12" Cast Iron Plate & Frame Filter Presses, 12 and 20 Chambers.
- 5—Sweetland Filters, #2, 5, 7 and 12.
- 2—Oliver Rotary Vacuum Filters, 5'3"x8", steel construction with monel screens.
- 1—Oliver Rotary Steel Filter 3'x1'.

**CENTRIFUGALS**

- 1—A. T. & M. 40" Rubber Lined Center Slung Centrifuge, Perforated Basket with Explosion Proof Motor.
- 2—A. T. & M. Stainless Steel Suspended Type Centrifuges, 48" Imperforated Baskets with motors.
- 1—A. T. & M. Stainless Steel Suspended Type Centrifuge, 54" Imperforated Basket with motors.
- 2—Fletcher 40" Whirlwind Centrifuges, Bronze Perforated Basket with Explosion Proof Motors.
- 1—Tolhurst Stainless Steel Suspended Type Centrifuge, 48" Imperforated Basket.
- 1—Fletcher 48" Whirlwind Centrifuge, Bronze Perforated Basket with Explosion Proof Motor.

- 1—Tolhurst Center Slung Centrifuge, 36" Perforated Steel Basket with Explosion Proof Motor.
- 1—Sharples Stainless Steel Super D Center, Model PN-14.
- 6—Sharples #16-Y Stainless Steel Super Clarifying Centrifuges.

**MIXERS**

- 2—Banbury Mixers #1 and #9.
- 12—Simpson #20 Intensive Mixers "Unused".
- 1—Simpson #1 Intensive Mixer.
- 1—Readco Stainless Steel Jacketed Double Arm Jacketed Mixer, Sigma Blades, 225 Gals.
- 4—Baker Perkins Steel Jacketed Mixers, Sigma Blades, 100 Gals.
- 3—Baker Perkins Stainless Steel Jacketed Mixers, Sigma Blades, 100 Gals.
- 3—J. H. Day Mogul Vacuum Mixers, Sigma Blades, 2 1/2 and 5 Gals.
- 1—J. H. Day Jacketed Powder Mixer, 5000 lbs. Center Discharge.
- 4—Turbo Steel Jacketed Mixers, 700 Gals. Each.

**PULVERIZERS—GRINDERS—MILLS**

- 1—Mikro #3TH Mikro Pulverizer with 30 HP Motor.
- 1—Mikro #3W Pulverizer.
- 1—Mikro #2TH Pulverizer, Stainless Steel & Bronze Construction, with Motor.
- 1—Mikro #1SH Pulverizer with Motor.
- 1—Ball & Jewell #20 Stainless Steel Rotary Cutter.
- 2—Ball & Jewell #2 Rotary Cutter.
- 1—Blaw Knox Air Mill Pulverizer.
- 1—Mikro Stainless Steel Atomizer #6.
- 3—Thropp 2-Roll Rubber Mills, 18"x50".
- 1—Abbe #2 Buhrstone lined Pebble Mill, 5'x4'.
- 1—Gruendler #24-40 Hammer Mill.

**AUTOClaves—KETTLES—TANKS**

- 1—Adamson Steel Vulcanizer 6'x20'.
- 1—Stainless Steel Storage Tank, 16,000 gallons.
- 2—Blaw Knox Steel Jacketed Autoclaves, 300 & 500 Gals. Cap., Working Pressure 500 Lbs.
- 1—Patterson Steel Jacketed Autoclave, 900 Gals. Cap., Internal Pressure 120 Lbs.

- 1—Stainless Steel High Pressure Autoclave, 10 Gals. Cap., 250 Lbs. Internal Pressure.
- 1—Piraudier Glass Lined Jacketed Vacuum Reactor, 500 Gals. Cap.
- 12—Koven Stainless Steel Jacketed Vacuum Kettles, 390 Gals. Cap.
- 1—Koven Stainless Steel Storage Tank, 1200 Gals. Cap.
- 1—Koven Steel Mixing Tank, 1200 Gals. Cap. with Netico Drive, 10 HP Explosion Proof Motor, Turbine Agitator.
- 1—Artesian Steel Jacketed Kettle, 1,000 Gals. Cap., with Rake Type Agitator, ASME Code, 50 Lbs. Pressure.
- 2—J. P. Devine Jacketed Vacuum Reactors, 2,000 Gals. Cap. Each.
- 1—Lee Stainless Steel Jacketed Kettle Type C, 10 Gals. Cap., 125 Lbs. Jacketed.
- 3—Buffalo Steel Pressure Tanks, 1,000 & 10,000 Gals. Cap., 100 & 125 PSI, ASME Coded.
- 2—Steel Storage Tanks, 6,700 Gals. Cap. Each, 60 PSI.
- 10—Steel Fermenting Tanks, 1300 Gals. Each, with Coils & Agitators, 80 PSI.
- 25—Steel Storage Tanks, 9,000-17,500 Gals. Cap.
- 1—Steel Rubber Lined Storage Tank, 4,500 Gals. Cap.

**MISCELLANEOUS**

- 1—Orville Simpson #41 Rotex Screen.
- 1—Dayton Dowd Centrifugal Pump, Stainless Steel, Size 1C8, 35 GPM at 40' head, speed 1745 RPM, 2"x1".
- 1—Worthington Worthite Pump, with 7 1/2 HP Motor.
- 2—Worthington Anticiron Centrifugal Pumps, Model #3 CUI, 4"x2".
- 1—Lightning Mixer, Model SAG 1000, 10 HP explosion proof motor.
- 1—Nasco Drive, Model WT 27, with 2 HP Motor, 900 RPM, Ratio 3-1, Shaft RPM 18.15.
- 2—Downington Stainless Steel Heat Exchangers, 500 sq. ft. each.
- 1—Graham Stainless Steel Heat Exchanger, 13 sq. ft.
- 1—Edgmore Iron Works Stainless Steel Heat Exchanger, 35 sq. ft.
- 1—Monel Bubble Cap Column, 3'x9 1/2", 5 trays.

Established 1886

## R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY  
STATE HIGHWAY No. 29, UNION, N. J. • UNIONVILLE 2-4900

## SPECIALS FOR NOVEMBER

### NEW TANKS

25,000 gal. 10'6"x39"x1/4" or 5/16".  
15,000 gal. 10'6"x23"x1/4" or 5/16".  
12,000 gal. 8'x32"x1/4" or 5/16".  
10,000 gal. 10'x18"x1/4".  
8,500 gal. vert. 8'x23"x5/16".  
4,100 gal. vert. 5'x28"x1/4".

### USED TANKS

30,000 gal. 10'x47" ASME, 50 PSI.  
16,000 gal. 9'6"x45"x3/4" ASME 150 PSI.  
8,200 gal. 70"x40"x2" 390 PSI (4).  
6,000 gal. 8'x15"x3/4" ALUMINUM.  
3,400 gal. 7'4"x10"x3/4" type 430 SS.  
6,500 gal. TANK CAR TANKS.

### KILNS—COOLERS—DRYERS

10'x90'x9/16" Allis-Chalmers.  
8'x80'x3/4" Vulcan.  
7'6"x6'6"x125'x1/2".  
7'x160'x3/8" & 3/4" (2).  
7'x120'x3/4".  
7'x60'x3/8" with lifters.  
6'x27' Louisville, 4 1/2" SS tubes.  
502-20 Roto-Louvre.  
5'x30'x3/4" Ruggles Cole.  
4'6"x50'x1/4" with lifters.  
4'x35'x1/2" with burner.

AGITATORS—1 to 10 HP.  
AUTOCLAVES—2000 gal., 230 PSI.  
BLENDERS—Batch, 157 cu. ft.  
BOILER—2 HP, 100 PSI, gas.  
CENTRIFUGE—40" SS, Fletcher.  
CENTRIFUGE—24" Bird, Type CH, SS series 200.  
CLASSIFIER—Dorr DSHF  
COLUMN—SS 347, 6'x29", 21 trays.  
CONDENSER—Scraper, Aluminum.  
CONVEYOR—Belt, 375', cc. 18".  
CONVEYOR—Apron, 34' cc. 36".  
DRYER—Atmospheric, 5'x6'.  
DRYER—Rotary, Vac. 30"x8'.  
FILTER—P&F Sperry 12" Aluminum.  
FILTER—Sweetland #7.  
FILTERS—Rotary 8'x10'.  
FILTER—Rotary 8'x8' lead covered.

FURNACE—Rotary, Bruckner.  
HEAT EXCHANGERS—1035 sq. ft.  
4 pass 250 PSI.  
KETTLES—PFAUDLER. 400 & 500 gal.  
KOMBINATOR—K200 SS.  
MAGNETIC BELTS—90" cc. 30".  
MILLS—BALL, 6'x8'.  
MILL—TUBE, 5'x22'.  
MILL—Raymond 4-Roll.  
MIXER—PADDLE, 19"x24"x18".  
MIXER—Jacket & agit. 3900 gal.  
MIXER—Double shaft, 140 cu. ft.  
PULVERIZER—24"x18" Jeffrey.  
SCREENS—4'x7' Tyler  
SEPARATOR—FLIGHT, 14'9" cc.  
VAPORIZERS, SUBLIMATION — 4'x10'.

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### FOR SALE

1—Four Effect Swenson Evaporator  
1—Three Effect Swenson Evaporator with Salt Sol-  
tling Tanks, etc.  
1—Two-Stage Crystallizer  
Pumps, vacuum equipment, piping  
INSPECTION INVITED  
MANGANESE, INC.  
Box 2006, Henderson, Nevada

## NEW AND GOOD-AS-NEW EQUIPMENT

#316 Stainless Steel Tanks, new, 100, 200 & 360 gal.  
1—Stainless Tank 450 Chroma, vert., 7' x 10' deep.  
26—Jacketed Kettles—Stainless, Copper, Aluminum.  
1—J. N. Day Steam Jacketed 50 gal. Sigma Blade  
Mixer.  
1—Copper Evaporator, steam jacketed, 9'1" x 3'9".  
60—New Pressure Cookers, 18"x18" & 24"x28".  
50—Pumps—steam and electric.  
1—New Glass Nash Centrifugal Pump, 160 gpm.  
1—Jeffrey Vibrating Conveyor 15' lg, 12" wide.  
1—Bufflovak Jacketed Impregnating Tank 42' x 52".  
1—4 x 8 Sturtevant Jaw Crusher.

SPECIAL: 1—Horizontal Steel Tanks 12' x 27"—16,047 gals. each.  
1—Abbe Pebble & Tube Mill, 5' x 22"—Burr-Stone Lined.  
2—Boilers, Scotch—200 H.P. each with Oil Burners.

**H. LOEB & SON**

4643 LANCASTER AVE.  
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## SURPLUS EQUIPMENT

LATEST TYPE METALLURGICAL  
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Excellent Condition

Hardinge Conical Ball Mill 10' x 48"  
Vulcan Rotary Kiln 8' dia. x 80'  
Research Corp. Electrostatic Precip-  
itator  
Dorr Causticizing Equipment  
Oliver Rotary Vacuum Filters Al  
Dorr Type A Thickness  
Sampling Mill—Crusher, Rolls,  
Samplers  
Link Belt Screw & Belt Conveyors  
Turbo Mixer Agitators  
Norblo & Sly Dust Collectors  
Hardinge Feedometers  
Oliver, Dorr, Morris, Worthington  
process pumps  
Tanks and Bins  
Instruments and Controls

The above items include all auxiliary  
equipment with individual motor and  
control 220/440/3/60. The equipment  
may be inspected on foundations.

Complete List with Specifications  
Available.

**THE VULCAN  
DETINNING CO.**

SEWAREN, N. J.

### COMPRESSORS

I.R.—30—1000# 12 CFM  
Bury—200# 66 CFM  
I.R.—50—3000# 110 CFM  
Worth—1500# 219 CFM  
Worth—600# 310 CFM  
Worth—Booster—250#  
Worth—Booster—300#  
I.R.—Booster—200#

28 to 2000 CFM  
12# to 125#  
All Makes  
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Sizes  
in Stock

COMPARE AMERICAN REBUILTS  
YES! WITH NEW  
— SINCE 1902 —

### VACUUM PUMPS

60 CFM I.R. 5-5 x 3 1/2  
82 " I.R. 6-6 x 4  
187 " C.P. 10 x 6  
193 " Fuller Rotary  
276 " C.P. 12x 6  
355 " Penn. 7A—14 x 5  
800 " Worth 18 x 9  
1184 " Penn. 22 x 9  
1633 " C.P. 24 x 11  
1987 " Worth 26 x 13

AMERICAN AIR COMPRESSOR CORP.  
NORTH BERGEN NEW JERSEY



# FOR SALE—WE OWN IT OR CONTROL IT!

## COLUMNS—STILLS

- 2 Aluminum Bubble Cap Columns, 36" dia. x 45 plate.
- 1 Aluminum Bubble Cap Column, 27" dia. x 18 plate.
- 1 Aluminum Perforated Plate Column, 28" dia. x 36" plate.
- 1 Copper Column with 18—30" dia. perforated plates and 10—24" dia. bubble cap plates.
- 1 Copper Sieve Plate Column, 30" dia. x 22 plate.
- 1 Copper Perforated Plate Column 24" dia. x 14 plate.
- 1 Steel and Cast Iron Bubble Cap Column, 30" dia. x 62 plate.
- 1 Stainless Steel T316 Raschig Ring packed column, 24" dia. x 6'8" high.
- 1 Stainless Steel T316 direct fired Vacuum Still, 325 gal.

## CONDENSERS—EXCHANGERS

- 3 Aluminum tub. 166 sq. ft.
- 16 Alum. Coil Exch. 96 sq. ft.
- 5 Copper tub. 65, 95, 140, and 725 sq. ft.
- 3 Stainless Steel tub. 8½, 39, 330 & 400 sq. ft.
- 3 Stainless Steel Coil Condensers, 40 sq. ft. 80# pr.

## DRYERS—EVAPORATORS

- 1 Stokes #59A Jacketed Vacuum Rotary Dryer, 18" dia. x 42" long.
- 2 Atm. Double Drum Dryers, 22" x 38".
- 1 Cummor Rotary Hot Air Dryer, 46" dia. x 26" long.
- 1 Struthers Wells Evaporator, 100 sq. ft. tube bundle.

## FILTERS

- 1 Sweetland #5, 30 lvs.
- 1 Sweetland #12, 72 lvs.

- 1 Swenson Rotary Continuous Vacuum Filter; Precoat type, 8' dia. x 8' face, rubber covered and lead acid proof construction.
  - 1 FEINC Rotary Vacuum Filter, string discharge, 4'6" dia. x 6' face, aluminum.

- 1 Eitel Bronze Disc Filter, 90 sq. ft.
- 4 Pressure Leaf Filters, 70 to 90 sq. ft.
- 15 Filter Presses, Cast Iron:
  - 2 Shriver 36" rubber covered, closed dely. washing.
  - 1 Shriver 30", 35 rec. pl., open dely.
  - 1 Shriver 24", 40 ch., open dely., wash.
  - 1 Sperry 24", 15 rec. pl., open dely.
  - 1 Shriver 24", 28 ch., closed dely.
  - 1 Shriver 24", 12 ch. cl. dely., wash.
- 1 Louisville 8-roll Continuous Filter or Grains Press 24"

## JUST PURCHASED

- 8—15,000 gal. Vertical Welded Steel Closed Fermenting Tanks, 80 lbs. W.P., turbine agitator with 40 HP motor; 970 lin. ft. 3" pipe coil. Excellent condition.

## KETTLES—REACTORS

- 1 6 gal. Nickel Autoclave, agit.
- 1 Stainless Steel, Type 347 Autoclave or pressure tank, 250# pr. Elec. heated 850° F; 17¼" dia. x 9' high.
- 70 Stainless Steel and Stainless Clad open top, steam jacketed kettles—10, 40, 60, 80, 100, 150, 250, 500 gal. sizes.
- 1 Stainless Steel Kettle, 950 gal., 20# jkt. pr. vertical agitator, Type 347 shell, bolted C.I. top.
- 1 150 gal. Stainless Steel Steam Jacketed Kettle, open top, with double motion agitator.
- 3 300 gal. T316 Stainless Steel Jacketed Tanks, 10# water jkt, double motion agitators.

- 1 200 gal. Read Stainless Steel Jacketed Kettle, open top, double motion agitator, 10 HP motor.

- 1 3000 gal. Horiz. Steel Cooker, Vacuum Agitated.
- 1 4000 gal. Vertical Steel Cooker agitated.
- 2 Aluminum Reaction Kettles, Jkt'd. & Agit., 60 & 100 gal.
- 2 Copper Jacketed Agitated Vacuum Kettles, 4' dia. x 4' deep, double motion agitator.

## MILLS—PULVERIZERS

- 1 Paul Abbe #6 Pebble Mill, porcelain lined, 32" x 36".
- 1 Abbe #4A Pebble Mill, 45" x 48".
- 1 Hardinge Conical Ball Mill, Steel Liner, 4'8" dia. x 24" long.
- 1 Williams Hammer Mill, type AK; size A, stainless steel.
- 5 Mikro Pulverizers, #1-SH, #1-SI, #2-SI, #2-TH.
- 2 Premier Colloid Mill, 6" st. rotor, type U-3 & V-3.

## MIXERS—AGITATORS

- 1 Porter heavy duty jacketed double worm mixer—75 gal.
- 1 Dellenberger 100 gal. Heavy Duty Double Arm Mixer, fish-tail blades, jacketed.
- 1 Broughton Powder Mixer, double arm, 50 cu. ft.
- 10 Copper Conical Blenders, ¼, 1, 7, & 11 cu. ft.

## STAINLESS STEEL FABRICATION

We have in stock a quantity of Stainless Steel sheets: Type 304—12 ga., 14 ga., and 16 ga. Tanks, receivers, etc. fabricated to your specifications.

Write: Attn. Fabricating Division.

## TANKS

- 1 9000 gal. Horiz. Alum. Tank—NEW
- 35 Aluminum Tanks, closed, 4, 275, 330, 480, 500, 1350 & 1450 gal.
- 2 100 gal. Glass Lined Vacuum Tanks.
- 15 Horiz. Welded Steel Tanks, Lastiglass Lined, 15,200 gal.
- 3 Horiz. Welded Steel Tanks, Lastiglass Lined, 5800 gal.
- 5 Vertical Welded Steel Tanks, closed Mammal Lined, 7000 gal. & 2300 gal.
- 2 Vertical Closed Rubber Lined Tanks, 10,000 gal., with 25 HP Turbo agitator.
- 1 Vertical Rubber Lined, 6000 gal. open
- 5 Vertical Jacketed Pressure Tanks—Steel—30# steam jacket—8mm vacuum internally:
  - 3—34" ID x 15' H (approx. 700 gal.)
  - 1—23" ID x 10' H (approx. 230 gal.)
  - 1—23" ID x 9' H (approx. 195 gal.)

## STAINLESS STEEL TANKS IN STOCK

- 1 16,200 gal. Vert., closed, T304—NEW
  - 1 5700 gal. Horiz. T304—NEW
  - 1 4200 gal. Vert., closed, T304—NEW
  - 1 2350 gal. Vert., open, T302—NEW
  - 1 1400 gal. Vert., open, 16" L x 57" W x 57" D
  - 2 1000 gal. Vert. closed, T316.
  - 2 500 gal. Vert., T304—NEW
  - 40 Stainless Steel Tanks—from 9 gal. to 500 gal. sizes.
  - 12 3000 gal. Horizontal Stainless Steel Tanks, 5'4" dia. x 18'9" long, insulated and agitated. Excellent for transporting, storage or holding.

## MISCELLANEOUS

- 1 Bin, 400 cu. ft., T316, St.
- 2 Bird Susp. 48" Centrifugals, 48" dia. Stainless Steel Perforated Baskets.
- 1 Bird Suspended 48" Steel Centrifugal, Perforated basket; Bottom discharge.
- 1 Fletcher 30" Jr. Centrifugal Extractor, St. St. Imperi. basket.
- 1 Sharples #16 Super Centrifuge, stainless steel.
- 5 DeLaval Centrifuges, models #600, 74-11 and 94-01.
- 1 Deionizing System, 500 GPH. Zeolite.

- 2 Kux Machine Co. Model 25 Rotary Pellet Presses, 21 and 25 punch—with motor and vari-drive.

- 6 Stokes Rotary Pellet Presses, 16 punch, B-2, D-3, D-4.
- 1 Byron Jackson Deep Well Pump, 150 GPM 325' head, NEW.
- 4 Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.
- 1 Stainless Steel Horizontal Sterilizer or Steam Retort, 10# pr., 24"W x 26"H x 36"L.
- 1 Stokes Vertical Steel Jacketed Vacuum Chamber and Impregnating tank, 38"L x 25"W x 24"D.



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## NO REASONABLE OFFER REFUSED

International Stainless Steel Straightline Vacuum Filler, 160 per minute.  
Resino S and LC automatic Coppers.  
Pneumatic and Tite-Cap auto. Coppers.  
Fitzpatrick S.S. jacketed Comminuter, 7½ HP.  
CRCO New Way MH Wraparound Labeler.  
S. & S. G1, G2, G6 Auger Fillers.  
Stokes and Smith HG84 and HG88 Duplex Auger Powder Fillers.  
Colton 2 and 3 RP Rotary Tablet Machines.  
Stokes 2C Cream Filler and Closer.  
Triangle Elec-Tri-Pak G2C, A6CA Fillers.  
Filler 4-Head Stainless Steel Filler.

Horiz S.S. 14-Head Rotary Filler.  
Standard Knapp No. 429 Carton Sealer.  
Mikro 4TH, 3TH, 2TH, 1SH and Bantam Pulverizers; Schutz O'Neill Mills.  
Tri-Homo #5 Colloid Mill, 7½ HP.  
3500 gal. working cap. Steam Jacketed, Double Arm Mixing Tanks for mixing, storing or processing of your materials.  
Day 650 gal. Steam jacketed Mixer.  
B. P. 150 gal Unidor S. J. D. A. Mixer.  
Stokes, Day, New Era, Hottman Mixers, from 2 to 450 gal., with and without Jackets, Single, Double Arm Agitators.  
Baker Perkins and Readco Heavy Duty 5 to 150 gals. Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

Ross, Day, Pony Mixers, 8, 15 gal. caps.  
Day 100, 800, 1500, 2500 lbs. Dry Powder Mixers and Sifters.  
Lee 85 gal. S.S. Jacketed Mixing Kettle.  
N. E. and Lehman 3 and 5 Roll Mills.  
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### DRYERS & KILNS

Devine #12 Vac. Shelf Dryer, 40"x42" shelves.  
2—Ruggles Cokes 7½" x 60" & 8" x 40" Rotary Dryers.  
1—Allis-Chalmers 10" x 80" Rotary Kiln.  
1—Ruggles Cokes 84" x 28" Rotary Dryer.  
New Rotary Dryers, Kilns & Coolers built to order.  
2—Frocher & Co. automatic Conveyor Dryers.  
2—Albright-Neil 4" x 8" Atmos. Drum Dryers.  
1—Buffalo Vac. Drum Dryer 24" x 20".  
1—Christie 80" x 60" Rotary Indirect Htd Dryers.  
Gehrich Gas Fired Dryer, 12 trays 21" x 32".  
6—Steam, Gas & Electric Dryers, Tray & Truck.

### CENTRIFUGALS & CENTRIFUGES

5—Tolhurst 40" Suspended Type Centrifugals. Bottom Discharge. Motor Driven.  
6—Centrifugals 20", 30", & 40", Steel, Copper, Stainless & Rubber Lined.  
12—Sharples Centrifuges 25A Stainless. Also 2B.  
3—De Laval Multiple Clarifiers #200, 300 & 301.

### FILTERS

1—Vallex 41 Stainless Covered Leaf Filter, type 40.  
10—Bassett & Shriver 12", 18", 24", 30", 36", Iron Filter Presses. Also 12" Bronze.  
Sveetland & Oliver Rotary Vac. Filters.

### KETTLES & TANKS

1—Dopp 350 gal. Cl Agit. Jack Vac. Kettle.  
Devine 30" dia. Impure. Unit. closed Jack-Liquor & Impure. Kettles. Also 100 gal. size.  
Devine 1000 gal. closed Jack agit. steel kettle.  
1—2500 gal. vert. agit. Jack Steel Kettle.  
8—Jacketed Kettles 30 to 2500 gals.  
1—250 gal. Lead Lined Kettle.  
2—Pineider 500 gal. vert. Glass Lined Tanks.  
4—10,000 & 4,000 & 2,000 gal. Horiz. Steel Tanks.  
New Stainless Steel Tanks 50 to 3000 gals.  
50—Stainless Alum., Copper, Glass & Lead Lined Kettles & Tanks.  
Copper Varanah Kettles 150, 200 & 300 gals.

### PULVERIZERS & MILLS

#1 Raymond Automatic Pulverizer 20 H.P. motor.  
1—Raymond 200 Pulverizer 30 H.P. Complete.  
1—20000 Raymond Mills.  
1—Hammer Mills & Pulverizers 1 to 50 H.P.  
1—Schutz-O'Neill 20" Pulverizer. Also #1.

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## STEIN EQUIPMENT COMPANY

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Cable Machequip

1—Sturtevant 30" Rock Emery Mill.  
1—Robinson 22" Attrition Mill.  
1—Lehman 4 Roll W. C. 12x30" Steel Mills.  
5—Lehman & Kent 3 Roll Steel Mills.  
8"x22", 9"x32", 12"x30", 10"x40".  
1—#1 & 30" Double Steel Roller Mills.  
1—6" x 24" 3 nr. high steel Roller Mills.  
3—Houchin 18" x 30", 4 Roll Granite Stone Mills.  
2—Abbe 24" x 32" Pebble Mills. Also Jar Mills.  
4—Ball & Jewell & Loomister Rotary Cutters.  
2—U. S. & Premier 1½ H.P. Colloid Mills.

### MIXERS & SCREENS

Baker-Perkins heavy duty double arm Mixers, 100, 50, 3 & 4½ gals. Motor driven.  
Horiz. Mixers single & double arm to 200 gal.  
Day & Ross 40 & 15 gal. Pony Mixers.  
1—Century 2 H.P. 4 speed Vert. Mixer.  
6—Lead & Paste Mixers 50 to 150 gals.  
1—Tyler 3"x5" Vibratory 2 Deck Screen.  
Patterson 3½ dia. Stainless Conical Blender.  
1—Master Drum Type Blender 1000 lbs.  
Lancaster #3 Pan Mixer 7½ HP. M.D.  
15—Dry Spiral Mixers 50 to 2500 lbs.  
12—Portable Elec. Agitators ½ to 3 HP.

### MISC. & SPECIALS

2—Buffalo 6" dia. Vac. Crystallizers.  
Gould 75 HP. Centrifugal Pump, 250 PSI.  
4—French Oil Motor Driven Expellers.  
New 6" x 12" Lab Mixing Mills and Calenders.  
2—Farrel 2 Roll Types & Pumps.  
3—Rubber & Plastic Extruders 1" to 6".  
1—Stokes 2E Paste Filler up to 5 gal.  
1—Marco #200 Stainless Steel Homogenizer.  
1—Stokes & Smith & Day Powder Fillers.  
6—Filling Machines, Liquid Paste & Powder.  
Rotary & Single Punch Tablet Machines, ½" to 3".  
2—Hows Mosul Barrel Bag Packers.  
2—Revolving Pans 30" & 36".  
2—Stokes Vert. High Vac. Pumps.  
2—Worthington 12" x 12" x 12" Vac. Pumps.  
6—Devine & Buffalo Tablet Machines.  
Saw Machinery for Toilet Laundry Chip Liquid.  
Plastic & Rubber Hydr. Presses, Extruders & Injecs.  
1—Ham Molding Equivators.  
Roller & Screw Conveyors. Bucket Elevators.

### STEEL STORAGE TANKS

3—30,000 Gal. 11' x 43' x ¼" Horiz.  
12—10,000 & 20,000 Gal. 5/16" Horiz.  
14—8,000 & 10,000 Gal. R.R. Car Tanks.  
6—1,000, 5,000 & 10,000 Bbl. Vert.  
TANKS LOCATED ILL., N. Y., KANS.,  
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### YOUR PREFERRED SOURCE FOR GOOD REBUILT EQUIPMENT

Fitzpatrick Model D 58 Hammer Mill  
Sparkler SS Filter Model 33-D-17  
A T & T 60" Type 316 SS centrifuge 10 HP  
2 Buffonvac Vac. Shelf Dryers—20 shelves 38" x 42"  
complete units with condenser, vac. pump & motor  
2 Fletcher SS Extractors 30" & 40" Self Balancing  
3—30 gal. Reactors Jkt'd & Agtd Glass lined &  
type 347 SS throughout with condensers  
1—50 gal. Pfaudler glass lined Reactor  
Day Lab. 8 gal. Vac. Mixer SS Jkt'd—Sigma Arms  
Ball & Jewell size 1½ SS Rotary Cutter, 40 HP  
Stokes 40" x 100" Double Drum Dryer complete  
Buffalo 42" x 120" Double Drum Dryer complete  
Mikro 25 Atomizer complete with 25 HP motor  
5—Abbe Belgian Block mills—5" x 6" & 4" x 5"  
2—Bowen SS Spray Dryers—2" x 8" & 6" x 5"  
2—Bess 40 gal. Mammuth Pans Mixers  
New & Used Kettles, all metals & sizes  
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## DRYERS—KILNS

- 2—Vulcan 7' x 160', 7' x 110', 3/4" shell, 2-12" tires, complete.
- 1—Allis-Chalmers 10' x 90', 9/16" shell, 2-14" tires, complete.
- 1—Vulcan 8' x 80', 3/4" shell, 2—12" face tires.
- 1—6' x 60', 3/4" shell, 2-8" tires, complete.
- 1—Vulcan 4 1/2' x 50', 3/4" shell, 2-6" tires, complete.
- 2—Link Belt 27" x 8' monel, 27" x 10' steel, Roto-Louvre Dryers.
- 6—Rotary Dryers 7' x 70', 7' x 60', 5' x 67', 4'6" x 40', 4' x 25'.
- 3—Louisville Rotary Steam Tube Dryers 6' x 50', 6' x 30', 3' x 20'.
- 1—Louisville Rotary Steam Tube Dryer 6' x 27', S.S. tubes.
- 2—Devine 17 shelf double door vacuum Dryers 59" x 78".
- 2—Devine 10 and 6 shelf vacuum dryers 40" x 43".
- 5—Stokes & Buflovak Rotary Vacuum Dryers 30" x 8', 3' x 15', 6'6" x 38'.
- 5—Buflovak 60" x 144", 42" x 120", 32" x 90" Atmospheric Double Drum.
- 1—Single Drum 60" x 80" Flaker.
- 1—14 Truck steam heated Dryer 1680 sq. ft.
- 1—Pittsburgh Lector Dryer size X, type CH.

## FILTERS

- 6—Vallex Pressure Filters 360 and 540 sq. ft.
- 1—Sweetland #12 with 36 leaves.
- 1—Sweetland #10 with 36 steel leaves.
- 1—Sweetland #7 with 27 steel leaves.
- 8—Oliver Rotary Vacuum 11'6" x 14', 8' x 12', 8' x 10', 8' x 8', 5'3" x 6', 3' x 1'.
- 3—Eimco Rotary Vac. 8' x 8', 4' x 5', 4' x 4'.
- 1—Oliver 6' x 3' steel Rotary Precoat Filter.
- 1—Feinc Rotary Vacuum 8' x 12' steel with drive, etc.
- 3—Shriver 36" P&F, 30 chambers, c.i., closed delivery.
- 1—Sperry 36" Recessed, 48 chambers, c.i., open delivery.
- 5—Shriver 30" P&F, 30 chambers, c.i., open delivery.
- 8—Sperry 24" P&F, 16 chambers, c.i., closed delivery.
- 1—Shriver 24" Recessed, 30 chambers, c.i., open delivery.
- 3—Shriver 18" Recessed, 30 chambers, c.i., open delivery.
- 2—Sperry Aluminum 30" and 24" P&F, 22 and 26 chambers.
- 10—Shriver, Sperry Filter Press Skeletons 42" to 18".

## CENTRIFUGALS

- 1—Fletcher 48" Suspended Aluminum bottom discharge, perforated basket, motor-driven.
- 1—Tolhurst 48" center slung, SS perforated basket.
- 1—AT&M 42" Suspended SS, bottom discharge, perforated.
- 1—Fletcher 40" Suspended, bottom discharge, SS, perforated basket.
- 1—Fletcher 40" center slung, rubber covered, perforated basket.
- 1—Tolhurst 32" Suspended Monel, bottom discharge, perforated.
- 1—Tolhurst 26" suspended Monel, bottom discharge, perforated.
- 1—Tolhurst 26" suspended, steel, bottom discharge, perforated.
- 2—Bird 36" x 50" solid bowl, rubber and stainless.
- 1—Bird 36" x 50 solid bowl, steel.

## FOR YOUR SPECIAL CONSIDERATION

## SPECIALS

- 1—Ruggles Cole Class XH14 parallel flow Dryer 90" x 60" NEW.
- 2—Oliver monel 8' x 10' Rotary Vac. Filters.
- 2—Oliver 5'3" x 3' Rotary Vacuum Enclosed Precoat Filters.
- 1—Rogers Spray Dryer 16' dia. with all accessories.
- 2—Pfaudler 100 gal. glass-lined Stills with Condensers.
- 3—Steel 2000 gal. jacketed, agitated, 200 PSI Reactors.
- 1—Pfaudler 350 gal. glass-lined, jacketed, agitated Reactor.
- 3—Dopp 250, 150 gal. jacketed, agitated Kettles.
- 3—Rotex #42 Double Deck Screens 40" x 84".
- 1—Buflovak VRC, S.S. Single Effect Evaporator 94 sq. ft.
- 1—Swenson Quadruple Effect Evaporator S.S. 2600 sq. ft.
- 1—Buflovak 6' dia. Vacuum Crystallizer.
- 1—Hardinge 4 1/2' x 16" Conical steel-lined Ball Mill 30 HP motor.
- 1—Vertical Storage Tank 30' dia. 26" high, 135,000 gal.
- 1—Bird 18" x 28" steel solid bowl Centrifugals.
- 2—Sharples #16-P Monel Pressure-tite Centrifuges.

## PULVERIZERS

- 2—Raymond 4 roll High Side Mills, complete.
- 5—Al. Ch. 6' x 22' steel lined Tube Mills.
- 4—Prater Mills, type G55 with screen discharge.
- 1—American Pulverizer Company 24" x 24" Ring Crusher.
- 1—Bauer 36" Attrition Mill 2-50 HP motors.
- 17—Patterson, Abbe Pebble & Ball Mills 60 to 1000 gals.
- 2—Premier Colloid Mills 8" dia., S.S.
- 1—Eppenbach QVT Colloid Mill.
- 2—Jeffrey 36" x 24", 20" x 12" Hammer Mills.
- 3—Raymond, Gayco Mechanical Separators 14', 12', 4'.
- 1—2 Roll Rubber Mill 6" x 12".
- 2—Mikro No. 151, No. 15H Pulverizers.
- 1—Fitzpatrick Comminuting Mill 7 1/2 HP.

## SCREENS

- 1—Selectro S.S. double deck 4' x 10'.
- 5—Sprout Waldron S.S. sgle. deck, 40" x 84".
- 1—Robinson Triple Deck 40" x 104".
- 4—Tyler Hammer 3' x 15', 3' x 10', 4' x 7' Single Deck.
- 5—Tyler Hammer 3' x 5' Triple Deck.
- 1—Abbe #2 Blutergess Sifter.

## MIXERS—ALL TYPES

- 4—Baker Perkins 200, 100, and 50 gallon, jacketed, double arm, sigma blades
- 1—Baker Perkins 300 gal. Unidror S.S.
- 1—Baker Perkins 1/2 gal., jacketed.
- 1—Baker Perkins, type JNM, 100 gal., jacketed, double arm.
- 1—Day 30 gal. Imperial jack. double arm.
- 10—Rodgers 200 to 3000# Powder Mixers.
- 12—Electric, Port. Agitators 1/4 to 5 HP, NEW.
- 4—Day, Ross, 8 and 50 gal. Pony Mixers.

## MISCELLANEOUS

- 1—Peabody Gas Scrubber 25000 CFM at 500' F.
- 1—Brown Hoist steam Locomotive Crane, 25 ton capacity, 40' boom.
- 3—Butler Auto. hopper scale, barrel fillers.
- 1—Redler 7" Conveyor unit, 100' centers.
- 20—Bucket Elevators, steel housing, 34' to 90' centers, 8' x 5' to 24' x 8' buckets.
- 7—Stokes Vacuum Pumps 15 to 100 CFM.
- 1—Milton Roy Proportioneer Pump, S.S. and Hastelloy, 10 GPM.
- 5—Devine, Buflovak, Condensers and Receivers, 20 to 90 sq. ft.
- 7—Groen 150, 125 gal., S.S., jacketed, agitated, kettles.
- 4—Stokes DD2, D4 Rotary Tablet Machines.
- 5—38" dia. Stainless Steel Revolving Pans.
- 2—Nash #4, AL671 Vacuum Pumps.
- 10—Olivite, Duriron, Rubber, Durimet and Haves Centrifugal Pumps 6" to 4".



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## WILLIAM J. McCAHAN SUGAR REFINERY, PHILADELPHIA, PENNA.

**We are liquidating this equipment and offer, subject to prior sale:**

- 7—VALVEZ Rotary Filter Presses, type #4 & #4 SR, with Stainless Steel plates.
- 1—Triple-Effect LILLIE vertical EVAPORATOR, Cast Iron, 7'4" dia. x 12' high, with 406-2" copper tubes each effect, including BRONZE pumps, condensers, etc.
- 1—Triple-Effect LILLIE horizontal Evaporator, Cast Iron, 60" dia. x 9'0" long, with 106-3" copper tubes each

- effect, including pumps, condenser, etc.
- 77—40" dia. American Tool Works. (Robert's Patent) Centrifugals, with bronze baskets, belt-driven.
- 6—ALL-COPPER Calandria Pans & Evaporators, 14' x 12' dia., complete with catchalls, condensers, etc.
- 1—ALL-COPPER double-effect Evaporator, 78 5" dia., vertical with condenser, fittings, etc.

- 1—10' dia. Cast Iron Calandria Pan, complete with catch-all, condenser, Guild-Garrison Pump, fittings, etc.
- 8—CAST IRON BLOW-UP Tanks, 8' dia. x 8' deep.
- 8—HERSEY GRANULATORS, 5' & 6' dia. x 23' long, with gear reducers, heating coils, etc.
- 45—10' dia. x 20' high Round vertical CHAR Filter tanks, (West Point Fdy. & Mch. Co.) Cast Iron, 1 1/4" thick.

**ALSO:** Crystallizers, Attrition Mills, Crushers, Conveyors, Packaging and Weighing Mchs., Bag-Stitchers, Scales, pallets, copper & steel pipe, valves, etc., ITEMS too numerous to mention!

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AT&M Susp Centrif 30" solid basket  
Shriver 30" Filter Press 29 chamber P&F  
Sperry 18" Bronze Filter press 25 pits  
Rotary Dryer 9'x50' 3/4" shell 40 HP dr  
Bufflovak 2 Drum Dryer 42"x108" compl  
Bufflovak 2 Drum Dryer 24"x16" complete  
Pr & Schwartz Dupl Shelf Dryer 6x6 1/2 x7  
Kellogg Condensers, 1980 to 2300 sq ft  
Klein Filter powder type SS, 237 sq ft  
Swenson 4'x1' Rot Vac Filter, Salt type  
Oliver 6'x4' Rot Vac Filter, Salt type  
Oliver 6'x6' Rot Vac Filter, Salt type  
Foster Wheeler Part Superheater size 72  
200 gal Kettle, #316 Stainless 1350  
New Jersey Pony Labeler, model 86 ML  
Knapp Can Labeler adj to #10 cans  
Reitz RD-18 Disintegrator 100 HP motor  
Hardinge Tube Mill 4'x10' silex lined  
Abbe Tube Mill, 3 1/2'x10', Porc lined  
Day 3 Roll Mill, 14"x30" high speed  
Abbe Lenart Mixer 330 gal. 30 HP Mtr  
ADT De-watering Screen 6' wide, mod A  
Worthington Vacuum Pump Cylinder 18"x9"  
Abbe Blutegess Turbine Sifter, 3 HP  
Dopp Kettle Jktd Agit 56"x34" 250 gals  
Bufflovak 2-effect Vacuum Pan, 5' dia  
Krenz 6' Vac Pan 12' Str Side, St steel  
Monel Tank 2500 gals 6'x12' vert vacuum

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Jacketed Kettles  
Mixers-Ribbon &  
Sigma Blades  
Motors  
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Scales  
Sifters  
Stainless-Steel Tanks  
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FILTER PRESS, cast iron, 18", washing  
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ROTARY KILN, 15' x 5' D., complete with  
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250 gal. S.S. Tank, 42"x42", agit.  
600 gal. S.S. Tank, 34"x60"  
100 to 200 gal. S.S. Mix Tanks, water jkt.  
3000 gal. S.S. Truck Tanks, Trailered  
75 gal. Monel jkt. Kettle 35"x22", agit.  
100 gal. S.S. Clad jkt. Kettles, 30"x32"  
150 gal. S.S. Jkt. Kettle, 42"x30", agit.  
300 gal. Pfauder Horiz. Glass Lined Tank, 25"  
4-30 gal. Steel Kettles, 75# Jkt., A.S.M.E.  
Grundler W.S. Jr. Pulverizer, 10 H.P.  
75 to 1500 gal. Homogenizers or Viscosizers  
25' Centrifugal Extractors, copper baskets.  
Model 1480 Stokes High Vacuum Pump, 1 1/2 H.P.  
2" S.S. Centrifugal Pump, 2 H.P.  
Hobart Grinder, 1 1/2 H.P.  
30 ton Howe Suspension Tank Scale  
3-32"x30" Bufflovak Double Drum Dryers

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4—7' ID x 60' long Kilns complete, ALL WELDED, 9/16 shells, Timken bearing rolls, firing hoods, gear reducer and motor drives. One equipped with Manitowoc Recuperator.

1—5'6" x 31'.

1—4'6" ID x 36', brick lined, incl. motor drive.

## ROTARY DRYERS

1—96" x 54', 1/2" shell, Timken rolls, burner, gear reducer and motor drive, exhaustor, etc.

1—72" x 40', oil fired, gear reducer and motor.

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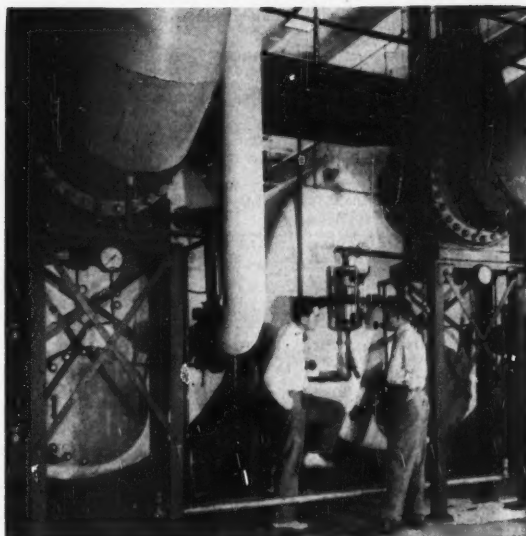
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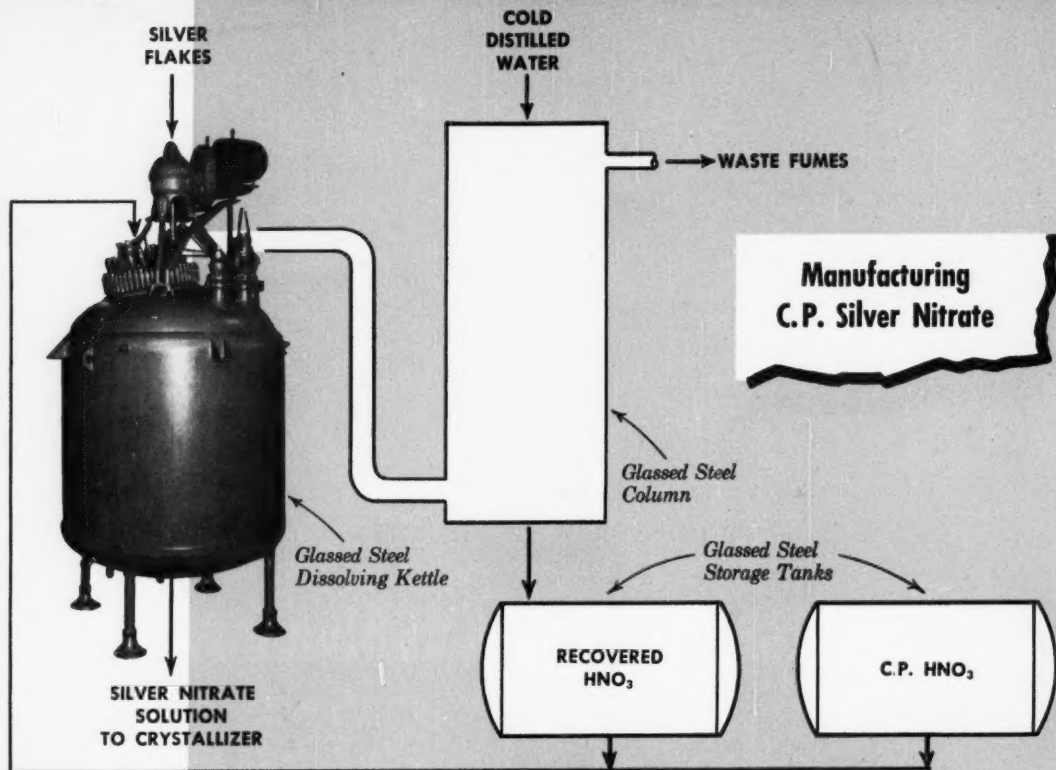
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